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AMERICAN SHIP BUILDING CO.

FIRST YEAR'S BUSINESS OF THE CONSOLIDATION—NOTES FROM THE DIFFERENT LAKE YARDS.

With the close of a year's business considerable interest is, of course, manifested in the affairs of the American Ship Building Co., which controls all but three of the ship yards of the lakes that are equipped for the construction of steel vessels. The annual meeting of the company takes place next month, and it is said that Mr. L. M. Bowers and John A. McGean, representing Rockefeller interests, will be given places in the board of directors and that Mr. Bowers will very probably be made a member of the executive committee. The executive committee is a small body in direct charge of all affairs of the company, and the appointment of Mr. Bowers to a place on this committee would mean that it has been deemed advisable to recognize the Rockefeller stock holdings, which amount to something more than a million dollars, secured through the sale of the American Steel Barge works to the consolidation. It is the general opinion in shipping circles that Rockefeller representation would add strength to the organization and should be welcomed at this time, in view of the mistrust that has prevailed regarding all the combinations, but as nothing has been said on the subject by the people in control of the ship yards there is no telling how they will take to it. The company has undoubtedly had a very successful year, and its stock has held closer to original figures than probably any of the other industrial organizations. The principals say that the decline that has occurred has not done as much to lower values in industrial shares generally as to large blocks of stock thrown upon the market first by the purchase of the Wheeler ship yard at West Bay City and later by the purchase of the Buffalo Dry Dock Co.'s plant. Another regular quarterly dividend of 1¾ per cent. on the preferred stock, payable July 16, was declared at a meeting of the executive committee on Monday last.

The Wm. Edenborn, one of the four very large steamers built by the American Ship Building Co. for the American Steamship Co. (A. B. Wolvin, manager, Duluth) was launched at West Bay City a few days ago. The Edenborn is 498 feet over all, 478 feet keel, 52 feet beam and 30 feet moulded depth. She has a quadruple expansion engine, 16½, 25, 38½ and 60-inch, with a stroke of 40 inches. She has a registered tonnage of 5,500 and will carry 9,000 tons of ore on a draught of 20 feet. Her speed is placed at twelve miles an hour when loaded and thirteen miles an hour when light. She hails from Duluth and will leave that port as soon as she is ready for sea, which will be in a week or ten days.

The steamer Simon J. Murphy was launched from the Wyandotte yard of the Detroit Ship Building Co. on Saturday last. She is the first of two steel freighters building at the Detroit works for Eddy Bros. of Bay City. The vessel is 446 feet over all, 50 feet beam and 28½ feet molded depth. Her engines are of the triple expansion, vertical, inverted type, the cylinders being 22 inches, 35 inches and 58 inches with 42 inches stroke. The boilers are of the Scotch type, 13 feet 2 inches in diameter by 12 feet long, each having two furnaces and using Howden draft.

Instead of one new steamer, as announced last week, the American Ship Building Co. is to build two for Capt. John Mitchell and others of Cleveland. Both are to be duplicates of the Mitchell steamer W. E. Reis, built last winter, and both are to be delivered upon the opening of navigation next year. It is quite probable that both vessels will be built at the Globe works, Cleveland. The capacity of each will be about 6,000 gross tons. Engines are to be triple expansion and the boilers of Scotch type. The price is said to be about $275,000 each.

The Craig Ship Building Co. of Toledo also has a new order for a steel steamer. The vessel is to be of Canadian canal dimensions, fitted for salt water service, and is for the Hawgood Transit Co. of Cleveland. She is to come out in April, 1901. This will give the Hawgood interests three vessels of canal size. They already have the Tampico and Eureka.

WORKS OWNED BY CARNEGIE STEEL CO.

Works owned and operated by the Carnegie Steel Co. now have an annual capacity of 2,750,000 gross tons of pig iron and 3,250,000 gross tons of steel. It is understood, of course, that the Carnegie Steel Co. is the manufacturing organization, and that the mines of the Lake Superior region, ships on the great lakes, railroad from Conneaut to Pittsburg and other allied interests are operated by other corporations. But the operations of the parent organization are in themselves enormous. First are the blast furnaces, as follows:

Edgar Thomson furnaces, located at Bessemer, two miles from Pittsburg, on the Pennsylvania, the Baltimore & Ohio, the Pittsburg & Lake Erie, the Pittsburg, Bessemer & Lake Erie and the Union railroad, and the Monongahela river. Nine stacks. Product: Bessemer pig iron, spiegel-eisen and ferro manganese. Annual capacity, 1,000,000 gross tons.

Duquesne furnaces, located at Duquesne, four miles from Pittsburg, on the Pennsylvania and the Union railroads, and the Monongahela river. Four stacks. Product: Bessemer and basic pig iron. Annual capacity, 800,000 gross tons.

Carrie furnaces, located at Rankin, one mile from Pittsburg, on the Baltimore & Ohio, Pittsburg & Lake Erie and Union railroads, and the Monongahela river. Four stacks. Product: Bessemer and basic pig iron. Annual capacity, 700,000 gross tons.

Lucy furnaces, located at Fifty-first street, Pittsburg, on the Allegheny Valley railroad and the Allegheny river. Two stacks. Product: Bessemer, forge and foundry pig iron. Annual capacity, 250,000 gross tons.

The company steel works, all located in the immediate vicinity of Pittsburg, are thus described:

Edgar Thomson steel works, located at Bessemer, two miles from Pittsburg, on the Pennsylvania, the Baltimore & Ohio, the Pittsburg & Lake Erie, and the Union railroads, and the Monongahela river. Four 15-gross-ton Bessemer converters. Product: Bessemer steel rails and billets, and iron and brass castings. Annual capacity, 800,000 gross tons of steel ingots and 50,000 tons of castings.

Duquesne steel works, located at Duquesne, four miles from Pittsburg, on the Pennsylvania and the Union railroads, and the Monongahela river. Two 10-gross-ton Bessemer converters; fourteen 50-ton open-hearth steel furnaces. Product: Rails, billets and splice, sheet and merchant bars. Annual capacity, 650,000 gross tons of Bessemer steel ingots, and 200,000 gross tons of open-hearth steel ingots.

Homestead steel works, located at Munhall and Homestead, one mile from Pittsburg, on the Pennsylvania, the Pittsburg & Lake Erie, and the Union railroads, and the Monongahela river. Two 10-gross-ton Bessemer converters; forty open-hearth furnaces. Product: Blooms, billets, structural shapes, bridge steel, and armor, boiler, ship and tank plate, and steel castings. Annual capacity, 400,000 gross tons of Bessemer steel ingots; 1,400,000 gross tons of basic open hearth steel ingots.

The rolling mills known as the upper and lower union mills in Pittsburg have a combined capacity of about 380,000 tons of material annually. They are thus described:

Upper union mills, located at Thirty-third street, Pittsburg, on the Allegheny Valley railroad and the Allegheny river. Product: Structural steel, steel bars and steel universal mill plates. Annual capacity, 250,000 gross tons.

Lower union mills, located at Twenty-ninth street, Pittsburg, on the Allegheny Valley railroad and the Allegheny river. Product: Universal mill plates, car forgings, bridge work, angles, links, pins and bar steel. Annual capacity, 130,000 gross tons.

The company also owns and operates the Howard Axle Works at Howard, one-half mile from Pittsburg, on the Pennsylvania, the Pittsburg & Lake Erie and the Union railroads. and the Monongahela river. Car and locomotive axles are produced at these works and the product is about 100,000 tons per annum.

General offices of the company are in the Carnegie building, Pittsburg. Branch offices and sales agencies are maintained in the following places: Atlanta, Equitable building; Boston, 125 Milk street; Buffalo, German Insurance building; Chicago, Marquette building; Cincinnati, Neave building; Cleveland, Perry-Payne building; Denver, Peoples Bank building; Detroit, 122 Griswold street; Minneapolis, Guaranty Loan building; New York, 71 Broadway; Philadelphia, Harrison building; St. Louis, 721 Olive street; San Francisco, 258 Market street; Washington, National Safe Deposit building; Montreal, Bell Telephone building; Mexico City, Calle de San Francisco; London, 71 King William street; Sydney, 24 Bond street; also in Shanghai, Tokio, Bombay, Calcutta and Rotterdam.

BLESSING JOHN D. ROCKEFELLER.

It is interesting to note the change of feeling towards John D. Rockefeller that has come over the vessel owners of the lakes within the past few months. Not long ago the Cleveland owner of a fleet of steel ships that will almost pay for themselves this year on dollar-and-a-quarter ore was quoted as saying that he had asked his wife to remember the great millionaire every day in her prayers, and now it is actually proposed to make Mr. Rockefeller president of the Lake Carriers' Association at the next annual meeting of that body.

Of course he would not conduct affairs of the office himself, the enthusiasts say, but he would have it in name and the work could be done by one of his representatives. Those of the ship owners who were indiscreet in the past are taking back all the bad names ever applied to the man of Standard Oil fame, and others are saying "I told you so; he has the ships and should all along have been relied upon to uphold freights."

But seriously speaking it is certain that the entire lake freight situation would be badly demoralized at this time if it were not for the amazing stand that Mr. Rockefeller's representatives have taken in putting out of commission some forty-five steel ships, many of them among the finest on the lakes, rather than submit to a general reduction in carrying charges. There is no question now of a determination on the part of the Rockefeller interest to carry out during the full season the policy inaugurated in October last. Even within the past few days, when an effort was made to reduce to 40 cents the rate on coal from Ohio ports to the head of Lake Superior, it was clearly evident that the Bessemer company was back of a determined stand taken by all the vessel owners against the reduction. In the past none of the ship owners dare lead in such a movement. This time they were united with an interest strong enough to have no great fear of what might happen on account of taking the lead, and they won. The official announcement, a day or two ago, that the Rockefeller ships would carry no ore this season at less than $1.25 was so bold, in view of unfavorable conditions in the iron trade, that most of the ore dealers say it may yet be necessary for a power even as great as the Bessemer company to take back such a statement. But on the other hand there is some sound reasoning in the claim that this will be done in the interest of vessels, mines and furnaces, in view of the very large proportion of this year's ore covered on the $1.25 basis.

"In other words," says a vessel owner who has kept in close touch with the situation, "it would seem that one aim of the Rockefeller interest is to bring about stability in carrying charges on ore and that the policy is not for this year alone. In the past matters of lake freight have been dictated by ore interests. The vessels have been paid at times just what certain large producing concerns saw fit to pay them. If Mr. Rockefeller, with predominant interests involved in carrying the ore, is to change this condition of affairs and have his say next winter when another year's business is being planned, he can not afford to retrace the steps already taken in regard to lake freights."

GEORGIA CLASS OF BATTLESHIPS.

THE QUESTION OF THE SUPERIMPOSED TURRETS FOR THEM IS AGAIN TO THE FRONT AND IS DECIDED FAVORABLY—GENERAL DIMENSIONS AND FEATURES OF THE LATEST BIG SHIPS OF OUR NAVY.

The question of superimposed turrets is again to the front. The new board has reversed the old board and is in favor of the superimposed turret system. It was at the instance of Read Admiral Bradford that Secretary Long ordered a special board of construction to inquire into the superimposed turret question in all its aspects and to report whether they should be installed on the new battleships. The board of construction, composed of five members, was increased to thirteen for the occasion, the additional eight being line officers of high rank. It stood seven to five in favor of the superimposed system, one member not voting.

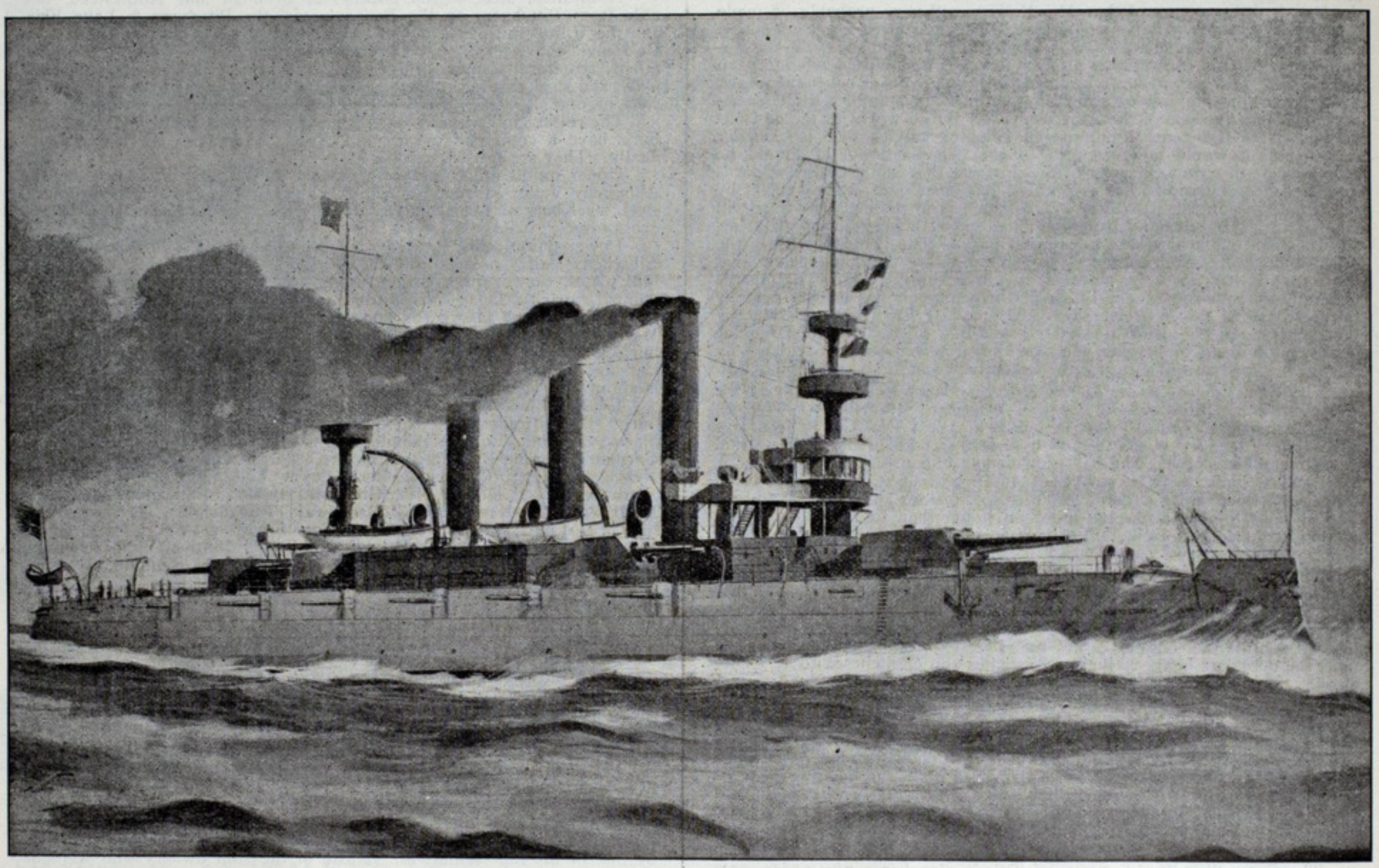
The circular calling for bids for these battleships will shortly be issued and it is expected that the ship builders will be required to submit proposals by September. With the turret question in reservation the general features of the Georgia class of battleships may be here discussed. The principal dimensions, power, bunker capacity, etc., are:

Length on load water-line	435	feet
Beam, extreme, at load water-line	76	feet
Trial displacement	14,650	tons
Mean draught at trial displacement	24	feet
Greatest draught, full load, about	26	feet
Coal carried on trial	900	tons
Coal bunker capacity	1900	tons
Feed-water carried on trial	66	tons
Maximum indicated horse-power	19,000	
Speed, contract, per hour	19	knots
Complement—officers, seamen, and marines	703	

Trial displacement means the vessel and her equipment complete, with 900 tons of coal, 66 tons of water for steaming purposes, plus two-thirds of total ammunition and two-thirds the total stores and provisions, and all the crew.

The ships will have the usual double bottom, and will be divided into the now common close water-tight subdivisions up to the gun deck. All fire mains will be carried below the protective deck, risers leading therefrom up to the stations on the decks above. Woodwork will be limited to the indispensable minimum, and all of that, save the India teak armor backing and the battens for the electric light wires, will be fire proofed. The decks will be covered with linoleum, with the single exception of the main deck, which will be planked over a complete metal deck. The armor protection to the hull will consist first of an 8-foot water-line belt, which at deepest load draught will be 1 foot above the water-line. This armor belt will extend from bow to stern. Amidships, for a distance of 190 feet, abreast the engines and boilers, it will have its maximum thickness of 11 inches. This 11 inches extends down to a distance of 5 feet, whence the armor tapers to 8 inches at the ledge. For a distance of 45 feet forward and aft of this thickest portion the armor will have a maximum thickness of 9 inches, tapering to 6 inches, at the lower edge; the next 20 feet forward and aft will be of 6-inch armor, tapering to 4.5 inches; the next 20 feet forward and aft will be of 5-inch armor, reducing to 4 inches at the ledge, and the rest of the ship's thence to the bow and to the stern will be of armor uniformly of 4 inches from top to bottom.

Above the main belt for a distance of 245 feet—the space occupied by the main, broadside, rapid-fire battery of six 6-inch guns—the sides will be protected by 6 inches of armor reaching all the way up to the main deck on which rest the turrets. This upper and lower casemate armor turns inboard diagonally aft and butts against the barbette of the 12-inch turret. Forward this 6-inch armor also turns inboard diagonally and terminates against the forward 12-inch turret, but the lower course, reaching from the protective deck up to the gun deck, is inclined, yielding just that much more protection against a raking fire. There is a complete protective deck, reaching from the bow to the stern. Throughout the run of the main portion of the water-line belt, this deck of 1½ inches rests flatly on the top of the inner upper ledge of this main belt, but thence to the bow and to the stern it curves downward. These slopes are 3 inches thick. A cellulose belt, 3 feet thick is to be worked along the sides above the protective deck all fore and aft, and reaching up to the under side of the gun deck.



THE BATTLESHIP GEORGIA.

The main battery will consist of four 40-caliber 12-inch breech-loading rifles, and eight 8-inch breech-loading rifles of 45 calibers. The secondary battery, or main rapid-fire battery, is composed of twelve 50-caliber breech-loading 6-inch rifles of high power. The local protection to these pieces are the 6-inch side armor and the heavy shields to be carried on each gun. Between each pair of these rifles there will be a 2½-inch nickel-steel bulkhead. The arcs of fire of these guns is 110 degrees—55 forward and 55 degrees aft of the beam. The ports or sponsons are set back from the main side line in pairs, so that two of the guns can be turned within the side line in each of the recesses, of which there are three on each side. The 12-inch guns train through arcs of 270 degrees, while the 8-inch guns have arcs of 110 degrees from directly forward and aft back towards the beam. The ammunition hoists, all of which are electrically controlled, are to have the following rates of supply: One full round of powder and projectile to each of the 12-inch guns every 90 seconds; one full round of powder and projectile to each 8-inch gun every fifty seconds, and three complete rounds to each of the 6-inch guns every minute. The turret turning gear, ramming gear, and elevating gear are all to be under electrical control.

The auxiliary battery will be composed of the following pieces. Twelve 3-inch, 14-pounders, rapid-fire rifles; twelve 3-pounders; four 1-pounders, automatic; four 1-pounders, single-shot; two 3-inch field guns; two Gatlings; six .03-inch calibre automatics. Four of the 14-pounders will be mounted on each side on the gun deck, two forward and two aft of the 6-inch guns; while the four remaining, two on each side, will be mounted on the main deck within the superstructure. All of the 14-pounders, besides their shields, will be protected by broad plates of 2-inch armor. There will be two automatic 1-pounders in each lower top, and two single-shot 1-pounders in each of the upper tops; the other small rapid-fire guns, excepting the field pieces, being mounted wherever advan-

tageous on the forward and after bridges, and on the superstructure deck forward and aft. There will be two submerged torpedo tubes situated forward, and the firing station, well protected from guns up to the 6-pounder, will be directly above the torpedo room.

The motive power will be two four-cylinder triple-expansion engines, actuating twin screws, and working in separate water-tight compartments. The cylinders will be: High-pressure, 35 inches; intermediate pressure, 57 inches, and two low-pressure cylinders of 66 inches, with a common stroke of 48 inches. The engines are expected to make 120 turns a minute when developing the required 19,000 indicated horse power. Steam at a working pressure of 250 pounds will be supplied by twenty-four straight-tube water-tube boilers, having a heating surface of 56,000 square feet, and a total grate surface of 1290 square feet. There will be six fire-rooms. There will be the usual blowers in each fire-room arranged to provide an ashpit pressure not exceeding 1 inch of water when running under forced draft. The engineer-in-chief has been particularly insistent that the engine-rooms and fire-rooms should be as comfortable as possible, and in the stowage of coal he has seen to it that there are no troublesome pockets.

The electrical generating plant will consist of ten units, each unit to be composed of an engine and dynamo mounted on a combination bedplate. Two units will have a rated output of 1250 amperes at 80 volts, while the eight other units will have a rated output of 625 amperes each at 80 volts; the total weight of the ten units complete not exceeding 166,000 pounds. Besides lighting the ship inside and out, controlling the turrets and raising the amunition, the blowers ventilating the hull and turrets will be run electrically; the air compressor for the torpedo flasks will be under electrical control, as will also the machine shops and the machinery of the laundry. The laundry will be able to handle daily the wash of seventy-five persons.

All principal water-tight doors will be fitted with power devices for closing from a central operating station, and there will be the usual indices showing which of these doors are open or closed. The pilot house will be of bronze, with a conning-tower of hardened steel, 9 inches thick, underneath it, and there will be a signal tower 5 inches thick on the superstructure deck just abaft the mainmast. There will be a dense-air plant for refrigerating purposes, having the equivalent of a daily output of three tons of ice. Pipes from this plant will lead to the principal magazines, enabling them to be kept at any desired temperature. The magazines will also be insulated by some approved non-conducting material.

Tanks for fresh water holding quite 10,000 gallons, and an evaporating plant of four units, each equal to a daily output of 4,750 gallons, and a distilling apparatus having a per diem capacity of 10,000 gallons will be provided. The accommodation includes separate cabins for an admiral and a commanding officer, a state-room and private bath for the admiral's chief of staff, and forty-two other state-rooms, most of them without the armor protection, so that they can have the advantage of natural ventilation and daylight. The maximum freeboard of 20 feet runs from bow to stern. Thirty-six months is the maximum time allowed for the building of these ships, which will bear the names of Pennsylvania, New Jersey and Georgia.

INDUSTRIAL ASCENDENCY OF THE UNITED STATES.*

The industrial ascendency of the United States is established by a comparison of the magnitude and character of her industries with that of her great rivals, Great Britain and Germany. It is evidenced alike by the larger aggregate and per capita value of her industrial products and by the much greater collective and individual earnings of her people. It is emphasized by a rapidity of growth unparalleled in the world's history. American manufacturers have not only retained their hold on the home market, but they have successfully invaded foreign markets and secured a constantly increasing proportion of international trade, as is clearly shown by the remarkable growth of our manufactured exports.

It is the character of international trade and not its extent that determines the measure of benefit to a country. Under modern conditions manufactures are not only necessary for successful industrial organization, but they also furnish the most satisfactory basis for profitable foreign trade. This latter fact is established by the experience of Great Britain for half a century. The remarkably successful efforts of Germany to extend her foreign trade through the protection and consequent prosperity of her manufactures furnish another striking illustration of the accuracy of the statement. The foreign trade most desirable for the United States to promote is that which provides for the exchange of her manufactured or partially manufactured products, those requiring the greatest amount of skill and labor in production, for the products of other countries which, from climatic or other causes, can not be produced here, or which we can not produce with an equal expenditure of labor or skill. Foreign trade of this nature builds up domestic manufactures.

It is quite natural that our people, with a productive capacity in excess of their requirements, should seek an outlet for the disposition of their surplus, but in our commendable search for new markets for American products we should not forget, however, that it is still necessary for the continued prosperity of American manufacturers that they should retain the American markets and that there should be no diminution in the purchasing ability of the American consumers from the present high level. This retention of domestic markets is rendered all the more imperative from the fact that under existing conditions many of our manufactures are only profitable when conducted on a large scale. We can not overlook the fact that the strenuous contest for markets, enforcing a demand for cheaper methods and greater economies in production, is bringing about revolutionary changes in manufacture. A margin of profits is secured only by the savings in cost of administration and distribution, and by the use of better methods and stimulated improvements in machinery, rendered possible through largely increased production.

While the growth of the foreign commerce of the United States is very creditable to her enterprise it does not furnish the best indication of her real position as a commercial nation. There is a class of people in this country who are inclined to follow the theories of British economists and exaggerate the importance of international trade. These theories had their origin in geographic rather than economic conditions.

The comparatively small area of the leading commercial nations of Europe gives a character to their foreign commerce which finds no analogy in a country of continental proportions like the United States. In one case the transportation of products a short distance across a river, a mountain range, or some less tangible boundary, constitutes foreign commerce, while in our country the exchange of the manufactured products of New England for the fruits of California or the cotton of Texas is classed as domestic trade. The value of the merchandise which crosses the English channel, the North sea, the Adriatic, or the Mediterranean, swells the vast sum of European international trade, while the much greater value of American products transported across our great lakes or the gulfs and bays that stud our coast are not taken into consideration in estimating the foreign commerce of the United States. A large portion of the internal commerce of the United States is analogous in every respect to the international commerce of Europe, and no comparison which seeks to determine the relative commercial importance of the nations of the world can be fairly made which does not take this fact into consideration.

Mr. Mullhall estimates the value of the internal trade of the United States in 1894 at $14,466,000,000. I believe that this estimate is a very conservative one. He estimates the internal trade of Great Britain for the same year as $5,794,000,000 and that of Germany at $5,500,000,000. If to these respective sums we should add the foreign commerce of each of these countries for the last year for which the statistics are available we should have this result: The total domestic and international trade of the United States would amount to $16,367,000,000, that of Great Britain would amount to $8,900,000,000 and that of Germany to $7,603,000,000. It will be seen that the total trade of the United States is approximately equal to that of Great Britain and Germany combined. When we consider that the population of Germany in 1895 was 52,000,000, and that of Great Britain in the same year was 39,000,000, or a total for both countries of 91,000,000, while the population of the United States for the same year was less than 70,000,000, we can better form some idea of the pre-eminence of the United States as a commercial nation.

The array of statistics which I have presented disproves the teachings of that class of political economists who confidently assert that there can be no normal growth of either domestic production or foreign trade in a country which has adopted a protective policy. Those who make the assertion are forgetful of facts and do not comprehend the nature of the policy. It is not a policy of exclusion but of discrimination. It does not seek to arrest foreign commerce but to direct its flow into profitable channels. It is not a policy of restriction but of expansion—expansion through a better diversification of national industries and a more thorough organization and development of national forces. It should be the primary purpose of our protectionists to aid through intelligent legislation in the great work of American industrial evolution and to encourage such agencies as will contribute to this result. Intelligent advocates of the protective policy have no programme to enforce except such as conforms to the demands of our national interests from time to time.

The creditable record of the past adds to our sense of responsibility for the future. We shall, however, enter upon the new century better prepared than ever before for industrial conquest, and with many conditions favorable to our continued success. We have reason to believe that recent legislation has settled the policy of the United States in regard to its currency and standard of value for the next generation. This will give confidence to enterprise and do much indirectly to aid in industrial development. The tariff policy of the country may also be looked upon as settled for many years to come, and this fact should also give a feeling of security alike to employers and employed. I do not mean that changed conditions will not necessitate an occasional revision of tariff rates; but we may confidently expect that these adjustments will be made with a view to protect and conserve our national interests.

To secure any considerable increase in our foreign trade in domestic products in the face of the fierce competition we are certain to encounter will, however, under any possible circumstances, make serious demands upon the resources of American producers. Every community interested in manufactures must furnish to its people better means for thorough technical education, having special reference to the demands of local industries. Our manufacturers and merchants must study more carefully the requirements of foreign markets. They must profit by the valuable experience of their rivals. They must acquire a better knowledge of the habits, demands, and language of their customers. In styles and in preparation for transportation they must be governed by the wishes, or prejudices, if you please, of their customers, and not by their own preconceived notions. Our capitalists and merchants must establish banking and commercial agencies wherever an extension of our trade is possible.

Equally exigent demands rest upon the National government in this connection, which can be met, first, by affording our people better facilities for transportation through the encouragement of frequent and direct steam service with the countries that are our natural customers; second, by the adoption of commercial treaties or reciprocity arrangements looking to the extension of our trade with our South and Central American neighbors and the countries of the Orient; and, third, by providing a more efficient consular service.

We enter upon the great industrial contests of the future with the prestige of unparalleled achievement. We have unequaled natural resources. Our productive forces are fully developed. Our industries are thoroughly organized. We have unrivaled wealth of soil and inexhaustible mineral deposits. Better than all, we have a vast army of intelligent, alert, and self-reliant producers, who are receiving a constantly increasing proportion of the benefits derived from our superior industrial organization. With such resources and such a people the industrial ascendency of the United States is secure.

*From an Address by Hon. Nelson W. Aldrich, United States senator from Rhode Island, delivered in Philadelphia recently, under the auspices of the American Academy of Political and Social Science.

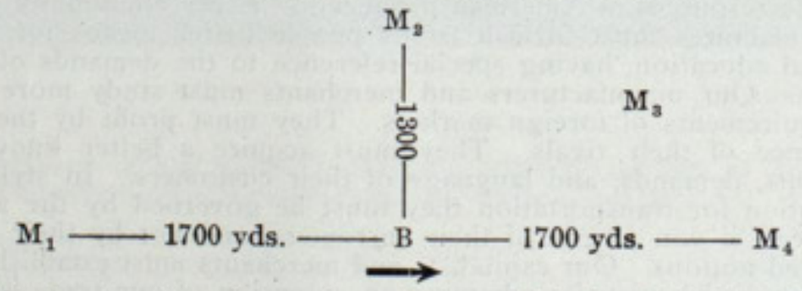
Three high-speed triple expansion engines of inverted marine type are offered for sale elsewhere in this issue by the Electric Boat Co., No. 100 Broadway, New York City. One engine is of 8, 12 and 18 inches cylinder diameters and 9 inches stroke; 300 horse power. The other two are each of 600 horse power. Their cylinders are of 10, 16 and 25 inches diameter and 15 inches stroke. This machinery was built to equal United States navy requirements and is in excellent condition.

ANALYSIS OF THE BELLEISLE.

A CAREFUL INQUIRY INTO THE INJURIES INFLICTED UPON HER BY THE GUNS OF THE MAJESTIC.

(From the Engineer, London.)

The Belleisle, her leaks having been plugged and some of the water in her pumped out, has reached Portsmouth dockyard. The accompanying photograph of the ship as she came up harbor with a tub on either side of her shows very well the means employed to plug her wounds in the unarmored portions of the hull. The ship was at once placed in dock, where she was shored up, and enough water let out to enable her to rest on her keel. The vessel was subjected to 9 minutes' consecutive firing, instead of the series of two minutes' fire that formed the original program. Why the change was made is not quite clear; it is generally regretted, as there was rather too much "killing the dead horse" about it for at least half the period. That is to say—saving for one hit—practically everything of moment was accomplished in the first two or three minutes. The following diagram represents the course and ranges:



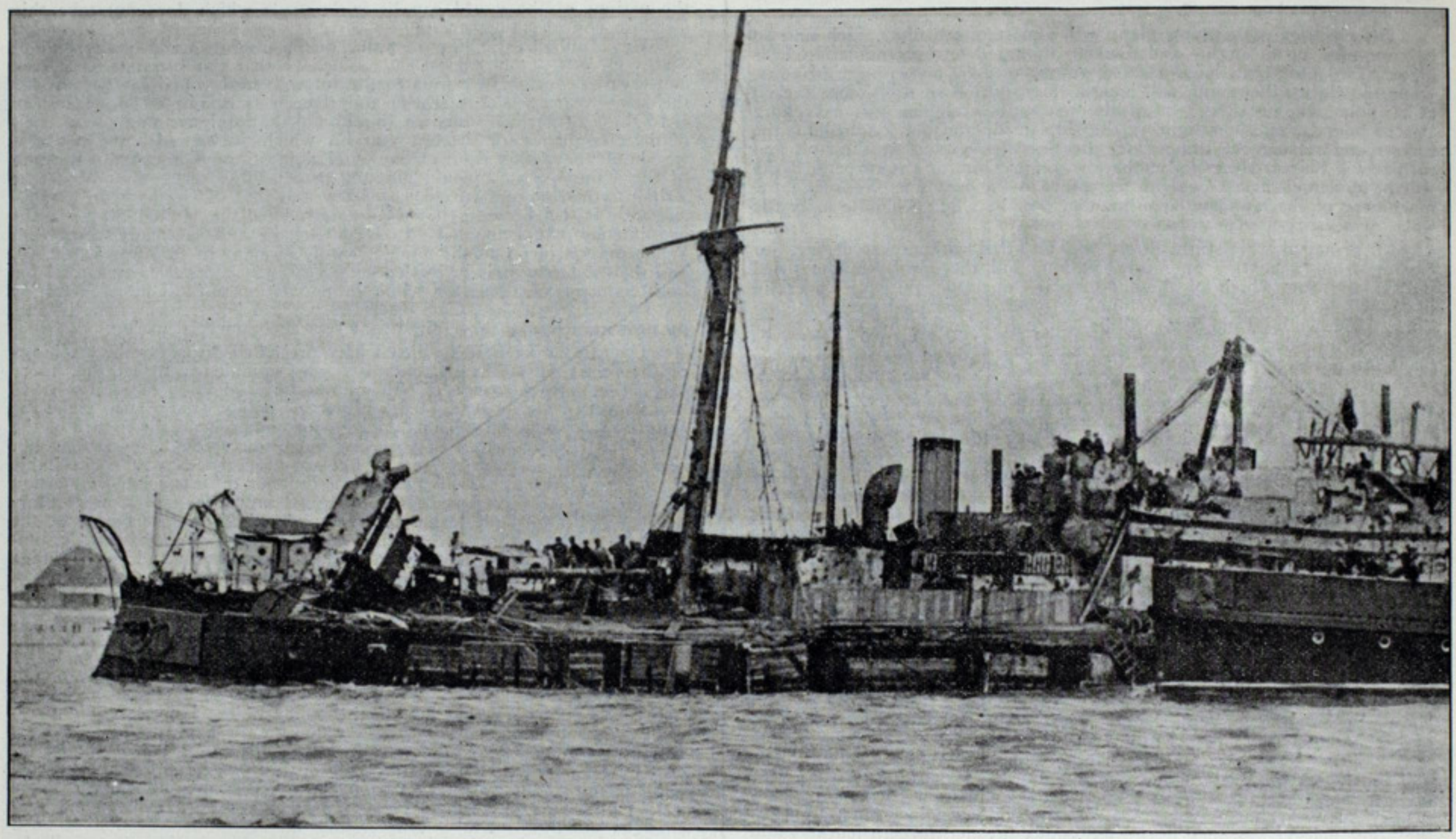
The Majestic steaming firing from M1 to M3, the Belleisle (B) being moored with her bow in the direction of the arrow. All the serious hits appear to have taken place between M1 and M2. The Majestic steamed at 6 knots.

There being considerable doubt as to the sequence of hits, saving that the second 12-inch shot hit the belt amidships, we propose simply to take them in the sequence in which they registered themselves upon the hull. So far as can be ascertained, the Majestic fired: Eight rounds of 12-inch common shell; seven rounds of 12-inch A. P. shot; about 100 rounds of 6-inch lyddite (at bow and battery); about 100 rounds of 6-inch common (at stern); 400 rounds of 3-inch various; 750 rounds of 3-pounder shell, and an indefinite number of Maxims. No torpedoes were discharged. Full charges were used throughout for all guns. Roughly speaking, about 30 to 40 per cent. of the projectiles fired were effective, the rest went over or just short, or else went clean through and burst beyond. Only about 10 per cent. of the projectiles were clear misses outside the black-and-white haystack of smoke that shrouded the target.

Here, perhaps, we should recapitulate the data of the Belleisle. She is of about 5,000 tons displacement, and the iron armor is disposed as follows: Belt, 12-inch, 6-inch; battery, 10-inch, 8-inch; redoubt below allery, 9-inch, 8-inch; conning tower, 12-inch. The belt rises about 2 feet to 2½ feet above the water-line, but at the time of the trial about 4 feet were shown. The redoubt is octagonal like the battery. The conning tower is situated under the bridge on top of the battery; it is very low, and the hood at least 18 inches above the walls. The erection in the bow, which has been generally believed to be the conning tower, turns out to be nothing but the seamen's "head," with, we believe, a lamp-room in the upper story.

Taking the 12-inch hits first, the demolition of this erection in the bow—clearly visible in the photograph—is variously attributed to a 12-inch and a 6-inch. We think, however, that it was due to one of the latter. On the belt, below where the funnel used to be, there are two points where shell have burst. One or both these are presumably 12-inch hits, there being in one case—the after one of the two—a 12-inch penetration of about 2-inch deep. The armor belt just below is cracked laterally for some 7 feet, and a vertical seam has also opened. The lateral crack is about 6 inches wide. There are the marks of a 6-inch shell in the aperture. The other hit has no mark beyond the large star caused by the burst.

On the water-line directly under the battery, there is a large hole made by a 12-inch shot. This is plugged, and inspection is not yet possible. This hit was that by which the ship eventually sank; though not, as erroneously supposed, the direct cause of her sinking. As we have



A SHIP THAT WAS SHOT AT—THE BELLEISLE AFTER THE BRITISH NAVAL EXPERIMENTS.

said above, it was the second 12-inch projectile fired. It is probably the prime cause of the crack a little more forward, as this hit blew the side right in, sending one fragment of armor right up through the flat armored deck above it. It did not, however, send anything down into the engine-room. We have not been able to learn where the shot went after going through the belt, which here offered a resistance equal to from 9 inches to 12 inches Harvey, because it was struck at a considerable angle—one, indeed, in which we might conceivably have expected the shot to glance off. Immediately abaft the casemate a 12-inch shell has hit. This shell has blown away some 10 feet square of side, which here looks something like the ruins of a recessed port. In the armored bulkhead there is a penetration, made either by the head of this shell or by a 6-inch shell that did not burst on impact. Well aft another 12-inch shell has hit. Here, too, a large piece of side is blown in, the deck above has disappeared and the iron deck beams are curled up into shapeless remains more like shavings than anything else. The external area or damage is about 10 feet; internally the whole of the cabins hereabouts were reduced to matchwood.

There remain two more hits that may be 12-inch. As we observed at the beginning of this article, there are so many hits, so many close together, and such complete destruction about their immediate areas, that the projectile cannot always be named to a certainty. But at the after end of the unarmored top of the battery, and towards the after end of what little remains of the funnel base, there are huge irregular holes, averaging perhaps 5 feet to 7 feet each. Most of the edges are bent inwards.

We now come to the most mysterious hit of any. High up on the port side after porthole is a clean, nearly exactly circular penetration of exactly 10 inches in diameter. There is around it an irregular depression, with a maximum depth of 2½ inches, and some 2 feet across at the widest. What made this hole no one seems inclined to be positive about; and, for the present at any rate, we prefer to leave it to conjecture. The head of a 12-inch projectile, a 6-inch lyddite, and a fragment from the hole in the side below, have all entered into the conjectures of those who have seen the hole, but not been allowed to inspect it closely. And here we may mention that on the upper and outer edge of the after port, on the starboard side of the battery, another projectile that is not very traceable has chipped out a piece of armor, and burst, judging by the marks. This

is the total of the big projectiles; three of them certain, and five of varying degrees of doubt. The bow and battery were fired at by 6-inch lyddite, the 6-inch common shell were directed aft. Between the damage done by one and the other there is no comparison. Both have made holes in the unarmored ends; both have done no harm at all to armor, both have made matchwood of the woodwork inside. But while the 6-inch common has destroyed as one might destroy a wooden box with an axe, lyddite has pulverized completely. Practically there are no remains beyond a dust. The lyddite has acted in a moment much as dry rot acts in a score or two of years. The deck in places is simply gone, and the edges have just the crumbled appearance of dry rot. In other places, too—to use another homely simile—the wood looks like the ends of a deal board that has been heavily hit by a hammer. This exactly gives the curiously compressed appearance. It is noteworthy that there is not a single sign of charring. It is not merely that no burnt wood is visible, there are no signs of scorching either, though possibly a week's bleaching under the sun may account to some extent for this.

Where 6-inch common shell have burst between decks, the deck above shows no sign of it, but it is quite another story with lyddite. Not only are huge holes blown upwards, but the entire deck is bulged up. The cross beams were thick and plentiful, but their resisting power has been nil. The 6-inch holes of entry and exit along the main deck side are all plugged, so no description of them is yet possible. Along the water-line they are very numerous, and effectually dispose of the theory that a water-line can hardly be hit. The extreme bow is absolutely untouched. Abreast of the funnel—curiously enough just where the armor is thickest—there are several dents where shells have gone in an inch or two. Many shells have burst against the battery, and this, being painted white, looks from a little distance as though it had been covered with Japanese naval flags. There is a great sameness about these shell marks, many of which are almost absolutely identical, and most are symmetrical in shape.

The masts are in a bad way. The foremast is the least damaged. The yard now on it was placed for signalling purposes after the firing, the yards on both masts were shot away, and both peaks were dropped. The mainmast is especially in a very bad way, and had to be shored up. It was cut in two all but a tiny piece, low down, and remained standing only because all the shrouds were not destroyed. The only boat left is the steam pinnace carried between the battery and mainmast. A 6-inch common shell entered this boat and blew the starboard side of it out into a number of shapeless streamers. It is absolutely clear that no ordinary boats will float after an action; it is doubtful if they will exist. The damage to the funnel cannot well be described, as there is nothing there but an enormous hole, with strips of iron twisted over it. In the photograph a wood screen will be noted built around this aperture.

The bridge, though much bent and twisted, survived; but the search-light was blown away. The conning tower was not hit at all. It has inside it some thin wooden dummies—mere laths of wood—so badly put together that the concussion of shells bursting on the topside shook them to pieces. The story about a shell having hit the tower and done this has no foundation in fact. The upper works were blown to pieces, the 6-pounders either knocked clean away or else blown sideways with some of their fittings melted. Ventilators and so forth were pitted with innumerable small holes from splinters and fragments. Inside the battery, in which at least one shell that had entered a porthole had burst, all the gun sights were destroyed. The guns themselves are absolutely unhurt; but, owing to damages to sights and gear, would have been of no use at all. The dummies around them were all burned. It is worth noting that two davits have been cut clean in two by projectiles. A great many small projectiles embedded themselves in places, and a few still so remain. Most, however, were shaken out.

Directly firing ceased, the ship was boarded by fire parties and by the officers told off to inspect her. She was then full of dense smoke, caused by the exploded shell, by the pierced funnel base, by a few small bonfires of dummies, and a lyddite shell or two that had failed to burst properly and were burning. Practically nothing was to be seen for the smoke and fume. It was taken for granted that the ship was on fire, and water was pumped into her. This lowered her freeboard, and the sea then rushed in at the hole on the water-line made by the 12-inch shot. The ship canted heavily, and every one was called on deck, a chief engineer coming up from below having a very narrow escape from death or disablement owing to the damaged capstan head breaking off at that moment. As it was, two stokers sustained injuries. The ship sank just after the last of the exploring party had left her—sunk, not by gun fire in the picturesque fashion that the daily papers described, but in a prosaic attempt to extinguish fire. Some of the Belleisle's hoses were still working when the ship was boarded, others were found cut to pieces. Most of the valves and so forth had disappeared.

A side experiment in connection with the Belleisle was to test the efficacy of the Douglas leak stopper, which works more or less on the system of an umbrella. For some reason or other, either because they were forgotten or through misunderstanding, only two were actually made use of. These were fitted in side holes just before the funnel, and answered with perfect success. It is unfortunate, however, that a far more ample test was not made.

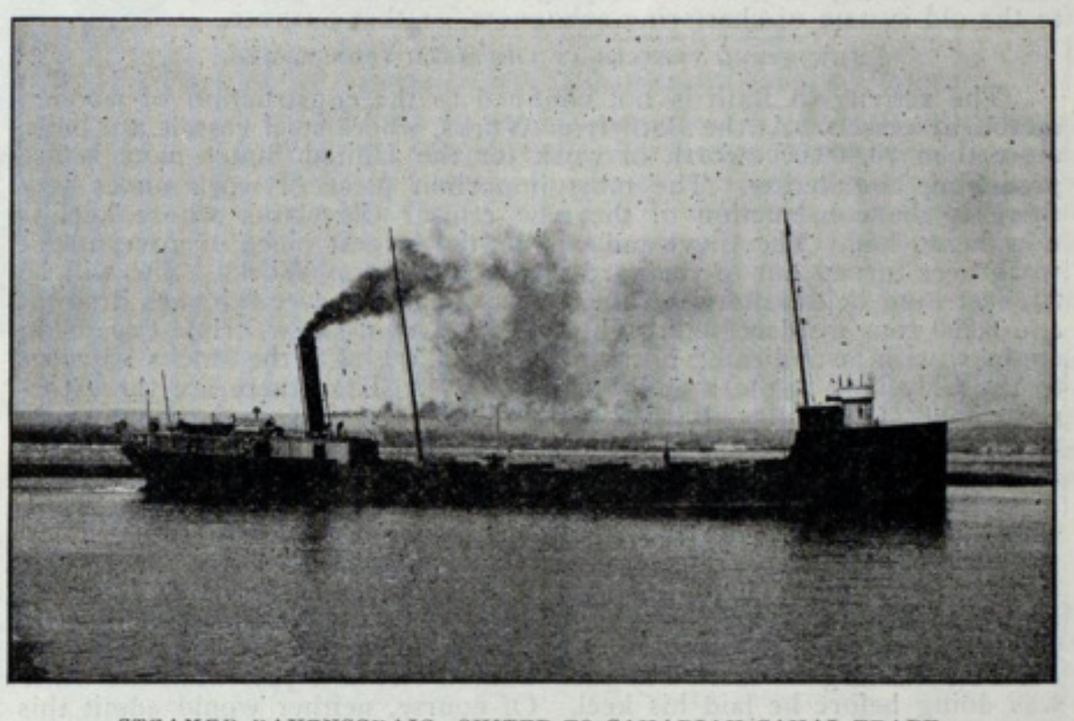
The report about Krupp armor being placed on the battery is pure fiction; this will be done for a future experiment that cannot take place for some time to come. It is said, however, that the work of refitting the Belleisle will be taken in hand at once, so that some idea of our capabilities in this direction in war time may be gauged. Another partial fiction refers to the torpedoes. These were actually in the tubes, and they were also fully loaded except for the pistols. One was found still in the tube, the other was gone. Very possibly it did dive under the Majestic, as report has it, but if so it went at a great depth; and the yarn about that ship having to maneuver to avoid it is pure moonshine. The condition in which the tubes were found is known to only a few officers.

Considerable comment has been caused by the action of the admiralty in connection with the experiment. After the firing the Belleisle was guarded by a cordon of destroyers, many naval officers even were only permitted to view her from fifty yards away. The strictest orders about secrecy were issued; and an enterprising journalist who had approached the ship in a small boat was captured by the destroyer. He was at once searched thoroughly, and every piece of paper in his possession torn up. A week later the ship was brought up to Portsmouth harbor in the daytime without a single tarpaulin to hide her. On Sunday she was in dock for anyone to gaze his fill at. There is a twofold reason. In the first place, the Belleisle experiment has been a triumphant vindication of certain British systems of ship construction. The Bouvet, Charlemagne, or Kaiser Friedrich der Dritte, had any of them been the target, would have fared as badly—very possibly worse—than the Belleisle; and there is no reason why that should be concealed. The British, Japanese, United States, and to some extent the Russian and Italian, are the only navies that count—from the constructional standpoint—in the light of the Belleisle experiments. The second reason is a more curious one. Mr. Goschen's antipathy to his critics in the press is well known, and he has recently found himself in a very bad way in connection with them. Unfortunately for themselves, the daily press as a body have committed themselves to a great many absurd and fictitious statements in connection with the Belleisle. To have placed the Belleisle on view is a very masterly flank attack upon the persecutors of the Admiralty, and, we are afraid, one that will have rather too much significance by-and-bye.

With regard to the special lessons to be drawn from these experiments, in so far as they relate to naval construction, and are likely to affect it in the future, a great deal may be said. We propose, however, to postpone it to another article, as certain conclusions are of a most vital nature, and worthy of close investigation in detail.

WILSON LINE STEAMER RAVENSCRAIG.

The first steel steamer built by the Jenks Ship Building Co. of Port Huron, Mich., is illustrated herewith. The vessel is the Ravenscraig of the Wilson line of Cleveland. A much larger vessel, the Capt. Thomas Wilson, is now nearing completion at the same yard for the same owners. The Ravenscraig was built to be used in service between the lakes and the Atlantic seaboard if it is at any time thought advisable to have her engage in that trade. She is of dimensions suited to passage through the Canadian canals—257 feet over all, 43 feet beam and 26½ feet moulded depth. Engines are of triple expansion type with cylinders



STEAMER RAVENSCRAIG—SUITED TO CANADIAN CANAL TRADE.

of 17½, 28 and 47 inches diameter and a common piston stroke of 40 inches. Steam is supplied by two Scotch boilers. The capacity of the vessel is about 3,000 gross tons on 18 feet draught and the indicated horse power about 800.

The second vessel building at the Jenks works for the Wilson interest will be of about 6,000 gross tons capacity and 1,600 indicated horse power. She is 440 feet over all, 50 feet beam and 28 feet moulded depth, with triple expansion engines of 23, 38 and 63 by 40 inches, and three Scotch boilers.

DEATH OF CAPT. WM. YOUNG.

Capt. Wm. Young, who died at his home in Vermillion, O., on Saturday last, of pneumonia, was known and highly respected among vessel men in all parts of the lake region. He was sixty-nine years of age and had followed the lakes for forty-three years, sailing vessels of what is known as the Minch fleet during the greater part of his life. He quit sailing only three years ago. Among all his friends he was known even as a man of nearly seventy years as "Willie" Young. The name was significant of the simple, honorable character of the man. Capt. Young had made investments that gave him assurance of comfort in his latter years and there were many regrets in vessel circles that his death should follow so close upon retirement from the lakes. He was a large stockholder in the Minch vessels.

The remains were brought to Cleveland for burial, and the pall-bearers were old-time friends—Geo. P. McKay, John W. Moore, James Stone, Wm. Gerlach, Thomas Jones and Hamilton Cummings.

James Gayley, head of the ore department of the Carnegie Steel Co., last week notified the alumni association of Lafayette College, Easton, Pa., his alma mater, of his intention to donate to the institution a completely equipped chemical laboratory, to cost $30,000. Henry W. Oliver, also of Pittsburg, will donate $5,000, to be used in installing a technical library to be attached to the Gayley building.

CHART NO. 1 OF ST. MARY'S RIVER has just been issued. Vessel masters of the great lakes have been looking for it for a long time past. It shows on a very large scale all the lower part of the river extending down from the lower end of Mud lake, where chart No. 2 begins, and including Detour, Drummond island and the lower part of St. Joseph's island, east and west, extending over to what is known as the North channel. This chart may be had from the Marine Review at 50 cents, or all three charts of the river at $1.50.

SHIP BUILDING IN MAINE.

A RESUME OF OPERATIONS AT THE DIFFERENT YARDS SHOWS THAT THEY ARE ALL WORKING TO THEIR FULL CAPACITY.

Activity in ship building throughout the different ports in the state of Maine, especially in the yards building wooden vessels, has held on longer than was expected. The river front at Bath is lined with vessels in various stages of completion, and down along the shore—at Waldoboro, Thomaston, Rockland and Camden—huge skeletons on the stocks are rapidly assuming definite outline and proportion. Not only is the number large (although, sad to acknowledge, it does not begin to compare with the output during the halcyon days of American ship building), but Maine never turned out a finer lot of vessels than those launched within the past year. And present indications, judging from the outlines of the vessels now on the stocks, give promise of even better performance.

It is interesting to note, during a tour of the ship yards, that the great American idea—the schooner rig—far from being pushed aside, a fate some of its critics have often predicted, is undergoing a process of steady development. It is not only the favorite build for small vessels, but it is being successfully applied to the very largest type of wooden vessels. It has already practically outraced its great rival of a few years ago—the coal barge—in one particular line of service. For several years the coal companies, or rather, the railroads controlling these coal companies, have been hugging the idea that the barge, under tow of a steam tug, was a more economical vehicle than the schooner for the transportation of coal from Pennsylvania, Maryland or Virginia ports. Developing that idea, they built hundreds of these barges and entered into competition with the schooners. The race was a warm one, but the schooner has already won, and its superiority as a coal transport, from an economical standpoint, is admitted by such concerns as the Chesapeake & Ohio and Pennsylvania railroads, which have practically gone out of the business of building barges for carrying coal, and will probably drop back to the old system of chartering schooners for that purpose.

NEW STEEL VESSELS AT THE BATH IRON WORKS.

The activity in Bath is not confined to the construction of wooden merchant vessels. At the Bath Iron Works, where steel vessels are built, more than $3,000,000 worth of work for the United States navy is approaching completion. The most important piece of work under way there is the construction of the new cruiser Cleveland, whose keel is now being laid. The Cleveland will be the largest piece of government work ever turned out of the yard of the Bath Iron Works. She will be 292 feet long below the waterline, 44 feet beam, 15 feet 9 inches draught and 3,200 tons displacement. She will have twin-screw, triple-expansion engines, with an indicated horse power of 4,500. On the stocks adjacent to the Cleveland is the monitor Connecticut. Then there are three torpedo boats, the Bagley, Barney and Biddle. The Barney is about ready to launch, the Bagley is in an advanced state of construction, and the Biddle's keel has just been laid.

A little way below the iron works is the ship yard of Percy & Small, where there are three large schooners in various stages of construction—a four-master, a five-master and a six-master, the latter the largest thing of its kind. There was great rivalry between Percy & Small of Bath and Bean of Camden in the building of the two six-masters now on the stocks in their respective yards. Each wanted to have the glory of building the larger vessel, but each wanted to know just what the other was doing before he laid his keel. Of course, neither would admit this charge. Bean's schooner is 300 feet long. Percy & Small's beats it by 6 inches. Bean's schooner is 48 feet wide; Percy & Small's 50 feet wide. The vessels are of about the same depth. Bean built the five-master John B. Prescott, the largest schooner now afloat, and he wanted to maintain this supremacy with regard to the six-master, but it seems that Percy & Small have gone him one better. Bean will still have a temporary advantage in that his vessel will be launched before that of Percy & Small, so that for a time, at least, his boat will be the largest six-master afloat.

One of the new Palmer fleet of large wooden schooners, the Maude Palmer, is rapidly approaching completion in the yard of the Hon. William Rogers of Bath. Although she is a 2,500-ton vessel, she is the baby of the fleet. The others are the Marie Palmer, 3,000 tons—launched last January from this yard, and now at Tampico, whence it is possible she may be sent to South Africa on a coal charter for the British government, as some negotiations in that direction are now pending; the Fannie Palmer, 3,500 tons, under construction in the yard of George L. Welt, at Waldoboro; and the Rebecca Palmer, 3,800 tons, now on the stocks in the yard of Cobb, Butler & Co., Rockland. A fifth schooner, like the Rebecca Palmer, will probably be laid down at one of these yards this fall. These Palmer schooners are worthy of more than a passing mention, because of the excellence of their construction. Mr. William F. Palmer of Boston, who is the managing owner of these vessels, is also their designer, and supervises every detail of the work.

HIGHEST TYPE OF AMERICAN WOODEN SCHOONER.

The Maude Palmer is 216 feet keel, 42 feet beam, and 23½ feet deep. She is designed to carry 2,500 tons in 21 feet of water. Her frame is of heavy white oak, cut in northern New England, a wood which it is difficult to obtain at the present time. The frames are spaced only 30 inches on centers. The usual spacing of frames is 36 inches. Her deck beams are 14-inch timbers, spaced only 4 feet. In order to still further strengthen her construction she is supplied with a full set of bolting, hanging and lodging knees, after the practice in vogue in the construction of some of the old-time ships. Her lower hold is of ceiled hard pine, 12 inches thick. The vessel is further strengthened by a short orlop deck forward, for the windlass and the forward house to rest upon, and another short orlop deck aft on which the afterhouse rests. The Maude Palmer is a double-decked vessel, in addition to the two orlop decks already referred to. She is flush-decked and surmounted by a fly rail.

The curious landlubber would be interested in the four large masts of Oregon pine, and the bowsprit of the same wood, now being worked over for this vessel. The masts are from 112 to 116 feet long, and cost about $500 apiece. They were brought overland from California, and the job of transporting them furnished the railroad companies with an engineering problem of some consequence, as it entailed the procuring the dimensions of every bridge and sharp curve on the route. The big spars were loaded on three flat cars, and they were "keyed up" in such a manner as to allow the middle car freedom of action to adjust itself to the swaying of the train. The Oregon pine bowsprit is also something of a novelty on down-east vessels, on account of its cost. The ordinary bowsprit is made of heavier wood, spliced in two or three sections. In the Maude Palmer the Oregon pine gives the stability of a single piece, and also the advantages of lightness. A difference of a couple of tons pitching a schooner down at the head makes considerable difference in its sailing qualities. In spite of the heavy load of canvas which this vessel will carry, she can be easily handled by a crew of six men. A pair of 30-horse-power engines does all the work of hoisting and trimming sails and handling of gear. These engines also do the greater part of the work of loading and unloading cargoes in foreign ports. But the greatest novelty to Jack Tar would be a steam-heated forecastle, to say nothing of cabins warmed in the same manner and at practically no additional expense, from the boiler used to furnish power for handling the vessels. The cabins are finished in panelled woods, with cherry pilasters, mouldings and trimmings and red ash panels. The toilet rooms have the best of modern open plumbing, and, taken all in all, the Palmer type of schooner is something of a revelation compared with the ship building product of twenty years ago.

VESSELS UNDER CONSTRUCTION AT DIFFERENT YARDS.

The yard of Kelley, Spear & Co. adjoins that of Mr. Rogers, and here this firm is completing a trim four-masted schooner for the account of John S. Emery & Co. of Boston. This schooner is a sister ship to the Calumet, recently built by this firm for the same account, and will differ only in length, the vessel now on the stocks being 10 feet longer on the keel than the Calumet. She will be employed in the West India and offshore trade. Kelley, Spear & Co. are also building for Capt. Charles Hodgkins of Lamoine, Me., a schooner which he will manage on his own account backed by Boston and New York investors. The Emery schooner is 190 feet on the keel, 40 feet beam and 18 feet 9 inches deep.

In the yard of the New England Co. at Bath a new five-master is being built for Capt. Potter of New York, the man who brought out the new Bean five-master, Jennie French Potter. The keel of this boat has been stretched and the transom frame is up. She will get to sea about the first of next year. Another vessel in this yard, almost ready for launching, is a lumber schooner for James B. Drake of Bath. She is designed to carry about 650,000 feet of lumber and will go to sea almost immediately.

E. & A. Sewall are laying the keels of two large steel sailing ships for the Standard Oil Co. It is said that they are designed for the East India trade and will be supplied with large tanks for carrying crude petroleum, but little is definitely known regarding these vessels.

At Thomaston, Me., Dunn & Elliott have in frame, for their own account, a four-master to carry 2,200 tons. Washburn Bros. of Thomaston have just completed a small lumber schooner for their own account.

At Waldoboro, George L. Welt is building the five-masted schooner Fannie Palmer. She is of the A1 class also, and is intended for Pacific trade. She is 257 feet long, 44 feet beam and 25½ feet deep. She is a complete three-decker. She will go to sea in October.

At Rockland, Cobb, Butler & Co. are getting out the Rebecca Palmer, the largest of the Palmer fleet, a 3,800-ton schooner. She is several feet shorter than the Fannie Palmer, but it 2 feet wider and 1½ feet deeper. She is also more heavily sparred. They are also building for John S. Emery & Co. of Boston a four-masted schooner, 160 feet on the keel, 37 feet beam and 17 feet deep, which will be commanded by Capt. Bjorkland of the bark Shetland of East Boston.

McKay & Dix of New York are building at Bucksport three schooners for the Greenland trade, to be used principally in carrying kryolite from Greenland to Philadelphia.

A GREAT FLEET OF AMERICAN SHIPS.

With the completion of seven large steamers now under construction the International Navigation Co. of Philadelphia will have twenty-six vessels in American line and Red Star line service. The seven new steamers are all of twin-screw type and of 10,000 to 12,000 tons as follows:

At the works of John Brown & Co., Ltd., Clydebank, Glasgow, Scotland—Steamers Vaderland and Zeeland, each 560 feet long and 60 feet wide and of 12,000 tons.

Harland & Wolff, Belfast, Ireland—Steamer Philadelphia, 560 feet long and 63 feet wide and of 10,800 tons.

Clydebank Engineering & Ship Building Co., Glasgow, Scotland—Steamers Haverford and Merion, each 530 feet long and 59 feet wide and of 10,000 tons.

Wm. Cramp & Sons Co., Philadelphia—Two steamers not yet named, each 560 feet long and 60 feet wide and of 12,000 tons.

Particulars of the International company's fleet already in commission are as follows:

	Tonnage	Length Feet	Breadth Feet
St. Louis, Twin screw	11,629	554	63
St. Paul, Twin screw	11,629	554	63
New York, Twin screw	10,803	560	63
Kensington, Twin screw	8,669	494	57
Southwark, twin screw	8,607	494	57
Friesland	7,116	455	51
Westernland	5,736	455	47
Aragonia, Twin screw	5,446	404	50
Noordland	5,212	419	47
Waesland	4,752	443	43
Pennland	3,760	374	42
Belgenland	3,692	423	40
Rhynland	3,689	423	40
Ohio	3,392	355	43
Pennsylvania	3,166	355	43
Indiana	3,158	355	43
Nederland	2,839	338	39
Switzerland	2,819	338	39
Conemaugh	2,328	310	37

AUTOMATIC WHISTLE OPERATOR AND RECORDER.

Illustrations in this column show a device that is daily becoming more important with the increasing distance between the bridge and steam whistle of a modern ship. Especially is this true of the large lake cargo carriers where we have the bridge well forward and the machinery astern in a 400 or 500-foot boat. Hand devices fail over great distances owing to the great length of wires and the difficulty of operation. The electrical operator consists of a specially cast double valve, Fig. 1. One side of this valve opens in the ordinary way by a hand pull; the other contains a valve operated by a solenoid magnet in the upper chamber. In the cut, the stem of the steam valve projects upward from its chamber and the stem of the solenoid core (a cylindrical piece of iron) projects downward directly over the valve stem. The wires attached to the magnet spool are shown in the covered cable which leads to the bridge and as many other operating stations as desired; many ships have five or six stations from which the whistle can be blown.

Fig. 2 shows the ordinary hand station on the bridge. Swinging the handle operates the whistle; fastening it by means of the spring-bolt shown at the left sets the clock

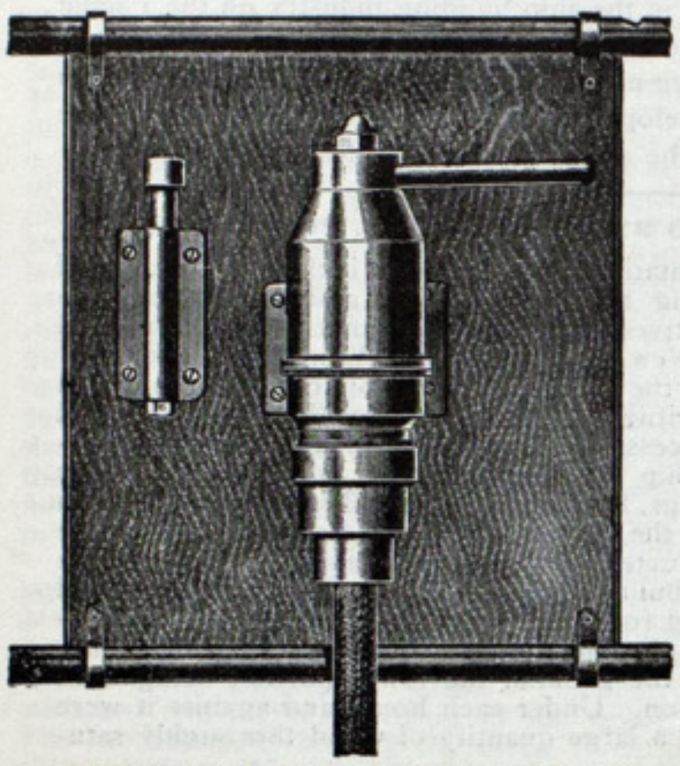


FIG. 2. COMBINED AUTOMATIC "AT WILL" WHISTLE.

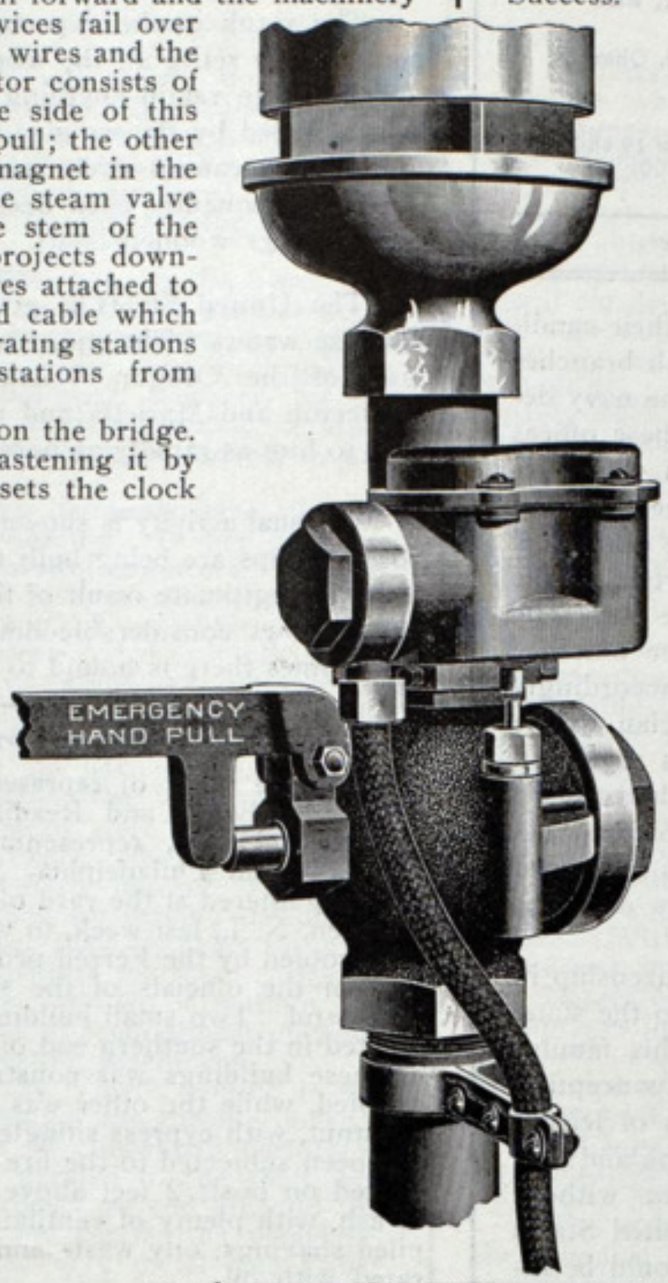


FIG. 1. ELECTRICAL WHISTLE VALVE.

in operation and the whistle then automatically blows the legal fog signal (5-second blasts at 55-second intervals) until the switch lever is released. The clock, which is a very strong, durable movement, completely enclosed, is shown in Fig. 3. Fig. 3 is the navy pattern and a telegraph key has been substituted for the hand lever of the ordinary pattern. The whistle is blown by depressing the key, and so sharp and effective is the operation that considerable speed may be attained by telegraphing with the steam whistle. The company issues a card showing the alphabet translated into the dots and dashes (or long and short whistles) of the Morse system.

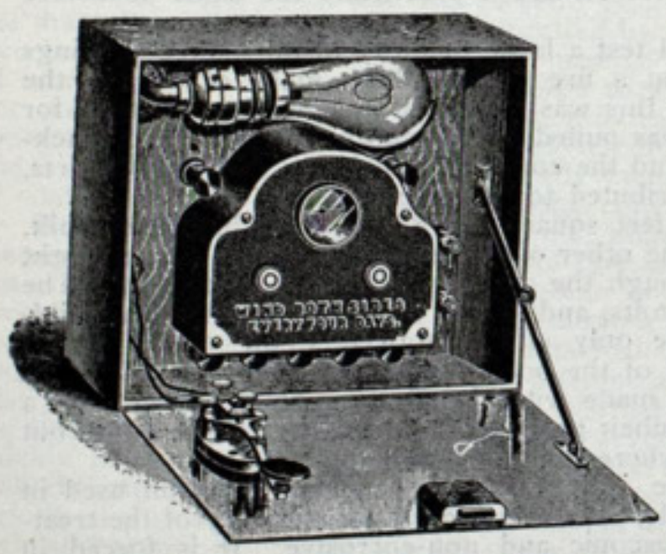


FIG. 3. U. S. NAVY STANDARD WITH TELEGRAPH SYSTEM.

Another device not shown in the illustrations is the recorder. When desired this instrument shows on a strip of paper a printed record of every time the whistle is blown. This device is invaluable in cases of collisions, groundings, fog, etc., as it will show just what signals were blown, and at what time they were blown, thus offering positive evidence on which considerable sums of damages might depend.

The Electric Automatic Whistle Operator has been adopted by the United States navy, by the United States light-house establishment, revenue cutter service and for the United States army transports; on the ocean steamers of the Cunard, White Star, North German Lloyd, Hamburg-American, International Navigation Co. (American and Red Star Lines), Standard Oil tank steamers, Boston Fruit Co.'s steamers, Ward, Mallory and Clyde lines, and on the steamers of the Old Dominion, Providence and Stonington and the Montauk Steamship Company; also on the Pennsylvania Railroad Co.'s Staten Island Rapid Transit ferries and Hoboken Ferry Co.'s boats, as well as on the steamers of the Northern Steamship Co. on the lakes.

Further information, illustrated catalogues, etc., will be mailed on application to the Signal & Control Co., 24-27 West street, New York.

Rear Admiral Hichborn, chief of the bureau of construction and repair, has returned from the Pacific coast. His reception along the Pacific coast was in the nature of an ovation. He was much impressed with what he saw. Many of his observations will be embodied in his next annual report. The admiral is much interested in the new dock yard at Bremerton and in the proposed deep water harbor at some point on the southern coast of California.

HOW RUSSELL WROTE "THE GROSVENOR."

"I am complimented by an invitation to tell what I can recollect of the writing, publication, and reception of the earliest of my sea books, 'The Wreck of the Grosvenor,'" writes W. Clark Russell in the June Success. "It chanced one day that a big ship with mast-headed colors, telling of trouble on board, let go her anchor in the Downs. I then lived in a town which overlooks those waters. The crew of the ship had mutinied; they had carried the vessel half way down the channel, when, discovering, by that time, what sort of provisions had been shipped for them, they forced the master to shift his helm for the inward course. The crew of thirteen or fourteen hairy, queerly attired fellows, in Scotch caps, diverse colored shirts, dungaree breeches stuffed into half Wellington's, were brought before the magistrate. The bench consisted of an old sea captain, who had lost a ship in his day through the bad conduct of his crew, and whose hatred of a forecastle hand was strong and peculiar; a parson, who knew about as much of the sea as his wife; a medical practitioner, and a schoolmaster. I was present and listened to the men's evidence, and also heard the captain's story. Samples of the food were produced. Nothing viler in the shape of food ever set famished mongrel hiccoughing. Nevertheless these thirteen or fourteen men, for refusing to sail in a vessel unless fresh forecastle stores were shipped, were sent to jail for terms ranging from three to five weeks. When I came away from the magistrate's court, after hearing the men sentenced, I found my mind full of that crew's grievance. I reflected upon how much of the hidden parts of sea life remained to be exposed to the public eye, to the advantage of the sailor, providing the subject should be dealt with by one who himself suffered and very well understood what he wrote about. This put into my head the idea of the tale which I afterwards called 'The Wreck of the Grosvenor.'"

HOLLAND IS A SEAWORTHY CRAFT.

Mr. E. B. Frost, secretary of the Holland Torpedo Boat Co., which built the Holland submarine boat, recently sold to the government, received a dispatch a few days ago from Capt. F. T. Cabel, who is in command of the Holland on her present trip to Newport, at New York. It was as follows:

"Tied up at navy yard last night. Heavy sea outside. Holland behaved beautifully."

This proved very satisfactory not only to Mr. Frost, but to naval officials as well, as the question had been raised as to the seaworthiness of the Holland in the open ocean. The boat reached New York by the outside passage, thus, it is believed, settling the problem as to her ability to sail in any kind of water.

DUES ON FOREIGN STEAMERS.

For many years past the payment of dues by United States passenger steamers in Canadian ports has been a source of great annoyance to the owners, more especially as Canadian passenger vessels were not required to pay dues upon inspection by United States inspectors. Some of the owners of steamers on the St. Lawrence river visiting Kingston for inspection brought this matter to the attention of United States Consul Twitchell. Consul Twitchell immediately represented the matter to Washington, making a full and comprehensive report. The authorities at Washington took the question up with the Dominion authorities at Ottawa, with the result that an order was issued from Ottawa that in future neither inspection dues or fees was to be demanded from United States passenger vessels on the inland waters. It was found by the Dominion government that the collection of these dues and fees was illegal under treaty relations, and the dues and fees that have been collected in the past will be returned to owners of vessels that paid them. Consul Twitchell has served the United States government for many years at Kingston and is well known to vessel owners on the lakes as a painstaking officer, ready and willing at all times to assist in removing any disadvantages under which vessels of either countries labor. He well deserves thanks for his energetic efforts.

EARNINGS OF SHIPPING.

The earning of the shipping of the nations of the world for the year 1897 is placed by Michael Mullhall, the eminent statistician, as follows:

Great Britain	£55,800,000	France	£ 4,800,000
Germany	8,300,000	Russia	3,000,000
Austria	1,400,000	Italy	2,900,000
Spain	4,600,000	Portugal	400,000
Sweden	2,100,000	Norway	5,000,000
Denmark	1,500,000	Holland	1,700,000
Belgium	700,000	Greece	1,200,000
United States	3,200,000	Canada	3,400,000
Australia	1,800,000		

This makes a total for the world of £101,800,000, of which £93,400,000 is credited to the European countries. The earnings of British shipping represent more than one-half of the total of the shipping earnings of the world.

Our esteemed contemporary, The Marine Review, has, commencing with its issue for June 10, made a further permanent addition of four pages to its size. The regular issue will in future be forty pages every week, and the foreign subscription is accordingly raised to $4.50.—Shipping World, London.

Chautauqua lake excursion via the Nickel Plate road. Tickets sold at reduced rates on July 6, good returning until Aug. 7, inclusive, on any one of our peerless trio of daily express trains. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 112, July 6.

MARINE REVIEW

Devoted to the Merchant Marine, the Navy, Ship Building, and Kindred Interests.

Published every Thursday at No. 418-19 Perry-Payne building, Cleveland, Ohio, by THE MARINE REVIEW PUBLISHING CO.

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Entered at Cleveland Post Office as Second-class Mail Matter.

Both army and navy are claiming Theodore Roosevelt as their candidate for the vice presidency of the United States. Indeed both branches of the service are honored by him. He was an executive in the navy department before he was colonel of a regiment. In both of these offices he distinguished himself. He foresaw the Spanish-American war. Indeed he clamored loudly for it. He was in favor of war at the start and did all he could to prepare the navy for it. He organized the celebrated mosquito fleet, and it was largely through his personal efforts that the navy was in such a high state of efficiency when the war broke out. The war on, however, he found the routine work attached to the office of assistant secretary of the navy particularly irksome and he accordingly resigned to assist his personal friend, Leonard Wood, physician to the president, in organizing the regiment of rough riders. This regiment, with Wood as colonel and Roosevelt as lieutenant-colonel, lent an air picturesque to the campaign. Roosevelt was daring in action and became the idol of his soldiers. When he returned to New York he toured the state for governor with a company of his rough riders and was elected by a comfortable though not a large majority.

In many ways Roosevelt represents the highest type of citizenship in the United States. He believes that every man owes a duty to the state. He holds that if a man has not means his first duty is to his family; but that if he has means his first duty is to the state. His conception is thus in keeping with the ideas of those distinguished men of leisure who compose the public bodies and common councils of England and who give a fair portion of their time to the public service without hope of financial reward. The tone of official life in the United States would be vastly improved if more men of Roosevelt's views could be induced to accept office. He has unquestionably strengthened the Republican ticket.

Following is a copy of the section of the Republican platform adopted at Philadelphia devoted to the upbuilding of American shipping:

"Our present dependence upon foreign shipping for nine-tenths of our foreign carrying is a great loss to the industry of this country. It is also a serious danger to our trade, for its sudden withdrawal in the event of European war would seriously cripple our expanding foreign commerce. The national defense and naval efficiency of this country, moreover, supply a compelling reason for legislation which will enable us to recover our former place among the trade-carrying fleets of the world."

This paragraph bears evidence of emasculation. It hasn't the ring to it that it should have. It is altogether a too-glittering generality. The platform should have specifically endorsed the Frye bill which practically embodies the sense of both houses of congress upon the subject of shipping and upon which much research and thought have been expended.

So far it has been a case of now you see it and now you don't. The naval board of construction originally planned the new battleships of the Georgia class to have the guns housed in single turrets. The vote stood four to one in favor of the single system. Later, however, Secretary Long decided to reopen the question and to submit it to a special board of thirteen, eight of them being officers of the line. The result is that this board has reported in favor of the double turret system for the Georgia, Pennsylvania and New Jersey and of the single system for the two new battleships authorized by the present congress, which, by the way, are to be named Virginia and Rhode Island. Secretary Long has approved the recommendation of the special board. The result seems to be to definitely commit the navy to the superimposed system. The position may yet be proved to be a strategical error.

Syren and Shipping is one of the English journals that has always been in close touch with operations at the works of Harland & Wolff, Belfast, Ireland. It is quite probable therefore that the following note in the last issue that has reached this country is reliable: "There has been so much talk about a coming steamer bigger than the Oceanic; so much doubt expressed; so many denials; that we consider we are doing no less than a public service in stating on the highest authority that the keel of a larger steamer than the biggest on record has already been laid at the Queen's Island yard, Belfast, and will, we understand, be launched this year. We have before expressed an opinion that the Rt. Hon. W. J. Pirrie, P. C., would not stop with the big White Star liner, and the exclusive information we are able to now give testifies to the correctness of our contention."

The result of the experiment of rebuilding the Hartford will be to permanently retire all the wooden ships of the navy. It has been found impossible to retain anything like full speed owing to the poor foundation afforded by the wooden hull of the old cruiser. It is manifest that the old ship cannot safely stand the wear and tear of her machinery, and it has consequently been deemed inadvisable to make any such changes on the other wooden boats.

The United States is gradually assembling a powerful squadron in Chinese waters. The squadron under command of Admiral Kempff consists of the Oregon, Newark, Nashville, Yorktown and Monocacy, Princeton and Marietta and the transport Zafiro. Other vessels will be sent to him as rapidly as possible.

Unusual activity is shown in the ship building industry on the Pacific coast. Ships are being built to meet the growing demands of commerce. It is the legitimate result of the new policy of expansion. The Hawaiian trade shows considerable development and with the pacification of the Philippines there is bound to be a great impetus in trade.

FIREPROOF WOOD BY THE FERRELL PROCESS.

A large party of representative business men, including officials of the Pennsylvania and Reading railroads systems and steamship companies, architects, representatives of chemical plants, contractors and builders from Philadelphia, New York, Boston, Wilmington and elsewhere, gathered at the yard of the New York Ship Building Co., in South Camden, N. J., last week, to witness a practical test of the merits of wood fire proofed by the Ferrell process. The tests were made under the direction of the officials of the ship building company, and proved highly successful. Two small buildings, 8 feet square and 13 feet high, had been erected in the southern end of the yard for the purposes of the tests. One of these buildings was constructed of Carolina pine, without being fire proofed, while the other was built of white pine, poplar, cherry, ash and chestnut, with cypress shingled roof, the wood in the latter building having been subjected to the fire proofing process. The buildings were supported on posts 2 feet above the ground, the lower portion being built of ash, with plenty of ventilation. Under each house and against it were piled shavings, oily waste and a large quantity of wood thoroughly saturated with oil.

At a given signal matches were applied to the inflammable material, and in a few minutes the flames were leaping high above both buildings, the intense heat driving the crowd back quite a distance. In 6 minutes from the time the match was applied the building not fire proofed was a roaring mass of flames, and in 16 minutes the structure was totally destroyed. On the fireproof structure, notwithstanding the oil-soaked wood both under and around the building continued to burn for a half hour, the only evidence of the fire was a charred and blackened exterior in some places, while the interior remained practically the same as before the match was applied.

Following this successful test a large quantity of oil-soaked shavings and wood were piled around a fire proofed box, made of ash, in the interior of the building, and this was also fired and burned furiously for 23 minutes, when the box was pulled out, somewhat charred and blackened, and was then opened and the contents consisting of 200 pamphlets, entirely uninjured, were distributed to the guests.

Two other buildings, 5 feet square and 8 feet high, had been built, one of fireproof wood and the other of ordinary wood, with electric light wires coiled around and through the structures from floors to roof. The current was turned on, 500 volts, and flames soon issued from the building not fireproofed, but the only effects noticeable on the fireproof building was the blackening of the boards at the points of contact with the wires. Tests were also made with the Bunson blast burner, and a flame of 3,000 degrees Fahrenheit projected against the treated wood, but it only charred at the spot where the flame was applied.

Mr. Ferrell, the patentee, claims that the chemical solution used in the fireproofing is non-volatile, thus insuring the permanency of the treatment. It is also non-hygroscopic and non-corrosive. It is forced in under heavy hydraulic pressure, mechanically controlled, without in any way injuring the fibrous tissues or changing its color or natural qualities. The treatment in every way tends to preserve and improve the wood, making it take paint, oil and varnish better, besides being just as easy to work with tools as the untreated wood. The process is owned by the United States Fireproof Wood Co., which is controlled by Philadelphians.

Through the great success of gas buoys in the lighting of lake channels, and as a result of the adoption of them by the government in large numbers for this purpose, Wm. St. John of the Safety Car Heating & Lighting Co., manufacturers of the buoys, has an acquaintance among ship owners and ship masters that extends to all parts of the lake region. The business of the Safety Car Heating & Lighting Co. with the railways of the country is immense. The use of gas in lighting ship channels is only a drop in the bucket. But the gas buoy is St. John's pet, and he keeps in touch with the ship owners. He has just sent to Capt. Geo. P. McKay of Cleveland a quantity of very nice leather card cases (an advertising specialty) to be distributed among the vessel men.

Four more of the wooden schooners that were sent to the coast through the Canadian canals in the fall of 1898 when the Atlantic Transportation Co.'s boom was on have returned to the lakes. The vessels are the Moonlight and F. A. Georger of the Gilchrist fleet and the Marion W. Page and Charles Foster, purchased recently by James Corrigan of Cleveland. The schooner Iron City, purchased some time ago by Tonawanda parties, has also returned to the lakes.

MARVELOUS BURSTS OF SPEED.

The recent trials in British waters of the torpedo boat destroyers Viper and Cobra have now been analyzed thoroughly by engineering authorities, and it seems that these tests have not only made more apparent the advantages already conceded to the turbine engine, but have disclosed others almost equally great. The Viper, on her builder's trials, developed something more than 35 knots an hour speed; that is more than 40 statute miles. Then she was turned over to the British government, and an elaborate system of tests was begun. With a third greater load, with decreased steam pressure and in rough weather she maintained an average of 34.25 knots in repeated runs over the measured mile. She also made a three hours' run of remarkable swiftness, but the exact figures for this have not been made public.

The Cobra, a vessel of about the same dimensions as the Viper (210 feet long, 21 feet beam and 12 feet 9 inches draught), has surpassed the Viper performances, but especial secrecy has been preserved throughout with regard to this vessel and the builders have not even disclosed the names of her owners. There is excellent authority, however, for the statement that the Cobra has done better than 41 statute miles, the highest speed previously attained by a steam-driven vessel, or, indeed, by any vessel of which there is authentic account.

Those who have been on the Viper during her trials have all commented upon the almost entire absence of vibration. In her case one might have successfully tried the old test of boastful engineers. A brimful wine glass resting on the turbine would have been whirled along 40 miles an hour and never have spilled a drop. Next observers were impressed by the noiselessness of the engine room and the simplicity and compactness of the powerful motors. Her main engine runs without any of the rattle and clanging that is the inevitable accompaniment of the present or reciprocating style of engine, and its only sound is a slight but impressive humming when working with full head of steam. This is the more amazing when it is remembered that the Viper's turbines, when the little flyer was rating along at top speed, were revolving more than 1,000 times to the minute—1,005 to be exact. Two hundred and fifty revolutions would be very fast for a similarly powered engine of the ordinary type. The Viper's auxiliary engines, for driving the pumps and so on, are reciprocating, and, of course, they manage to make themselves heard, but it is the purpose to substitute for them a turbine that will furnish the necessary auxiliary power, and do it without any fuss. Then her engine room will be so quiet as to seem almost uncanny to those accustomed to the bedlam of reciprocating machinery.

An almost equally striking point about the Viper's engine is the invisibility of its moving parts. Roughly speaking, the turbine consists of a shaft upon which are strung a number of concentric perforated discs. The perforations in the discs are not parallel to the shaft, but have a nicely calculated "pitch." The shaft runs fore and aft, and the outboard end pierces the skin of the vessel, and carries the propeller. The inboard part, bearing the discs, is encased in a metal jacket that corresponds to the cylinder of the piston engine, and is just large enough to receive discs and permit them and the shaft to revolve within it. Steam is admitted at the forward end of this jacket and in passing toward the after end, where it is exhausted, the only avenue open to it is by way of the "pitched" or slanting perforations in the discs. The pressure of the passing steam on the pitch turns the discs and with them the shaft on which they are fixed. There is no complicated network here of reversing levers, pistons, links and eccentrics. A single valve admits the steam; the jacket conceals all the moving parts.

In these latest tests the two torpedo boat destroyers have realized the marvellous speed possibilities suggested by the Turbinia, the diminutive boat with which Mr. Parsons first surprised the world. The absence of vibration remarked in her is remarked to an even greater degree in her successors. The economic value of this feature can hardly be overestimated. Vibration is one of the chief destructive agents to machinery and hull, and its elimination must greatly increase their life. Economy of coal consumption is another advantage conceded to the turbine.

But in the Cobra, as in the Turbinia, there is a serious drawback, the one that seems to stand in the way of the turbine's displacing the piston engine on large steamers. The turbine as now constructed is non-reversible; it can be driven in only one direction. To make the Parsons boats go astern a separate engine is attached to one of the four shafts and with this makeshift the Cobra has attained a speed of about 18 miles. The public could scarcely be persuaded to trust itself upon liners steaming 40 or more miles an hour, but unable to reverse their engines and stop quickly in time of danger. Companies whose ships were still equipped with the engines of today would not be slow to point out the perils that lurk in the steamship lanes for such should turbine greyhounds make their appearance in competition for ocean passenger traffic.

Still neither Mr. Parsons nor those with whom he is associated in perfecting his system has made any extravagant claims for it. Indeed, the inventor has at times spoken rather disparagingly; he placed the Turbinia at the disposal of disinterested scientific men for thorough tests, and the talk of three-day transatlantic liners and other marine miracles that has been heard in discussions of the Turbinia have no warrant in anything he has said about his invention. But that there is confidence in its great value is shown by the insistence with which the British admiralty conducts its costly experiments, and the interest with which they are watched by the scientific world at large. The three-day boat is not here, or the four-day boat; still there is ground for believing that the turbine principle is soon to have a trial at ocean crossing and its development is now so far advanced that a notable performance can scarcely fail to result.

One of the most beautiful calendars that has ever reached the office of the Review is the one issued by the Blair Coal Co. of Toledo. It is an exquisite reproduction in colors of George Taggart's painting "After a Long Silence," and represents an old couple reading a letter. The tone of the picture is soft and the printing most excellent.

"A MANUAL OF NAVAL ARCHITECTURE," by Sir Wm. H. White, director of naval construction in England, is one of the best-known books of its kind in the world. A fifth edition, revised and largely rewritten, is just out. It is a text book for students of naval architecture. Price $9. The Marine Review Publishing Co., Perry-Payne building, Cleveland.

DOUBLE TURRET IS APPROVED.

BATTLESHIPS OF THE GEORGIA CLASS WILL BE EQUIPPED WITH THEM—REVERSAL OF THE FORMER ATTITUDE.

Secretary Long has approved the report of the special board of construction which recommended that superimposed turrets be installed on the Pennsylvania, New Jersey and Georgia and ordinary turrets on the two battleships recently authorized, to be called the Virginia and Rhode Island. The turret question has been a source of lively controversy in naval circles and after the regular board of construction, consisting of the bureau chiefs, had passed upon the question, a special board was created, made up of line and staff officers of recognized ability on questions of naval construction, to consider it. The chief division was as to retaining the superimposed turrets, as on the Kearsarge and Kentucky, or going back to the system of placing turrets quadrilaterally, so as to fire in broadsides. On this the board divided, seven favoring the superimposed turrets while five were for quadrilateral turrets, and Capt. Barker favored a compromise, building part of each type. The report of the board says:

"In view of the strong minority of five members, Capt. Barker dissenting from either proposition, it was finally decided to recommend three battleships with superimposed 8-inch turrets and two with four independent 8-inch turrets arranged quadrilaterally. This was agreed to by twelve of the thirteen members constituting the board, Naval Constructor Taylor only voting against it."

The compromise report, as stated, is signed by twelve of the thirteen members. Naval Constructor Taylor submitted a minority report. Rear Admiral Barker also submitted a report giving reasons why, in his opinion, it was not wise to put superimposed or ordinary turrets on all the five battleships. The compromise report is merely a four-line recommendation that three battleships have superimposed and two battleships ordinary turrets. Admiral Barker's report of his suggestion that there be a compromise is as follows:

"It is admitted by all the members of the board that both plans are excellent, and that battleships built on those plans will be most efficient vessels. Without an exhaustive trial at target practice or, better still, in actual war, it is, in my opinion, impossible to state positively which of the two classes of battleships is the better, as there are advantages and disadvantages in both. Without, therefore, going into a long discussion of the merits and demerits of each class, I am of the opinion that of the five battleships which are to be built three of them should be built without superimposed turrets and two of them with superimposed turrets."

The board, as has been shown, switched this around so as to give two ships without and two ships with superimposed turrets. Constructor Taylor, in his minority report, says:

"The matter before the board is one of prime importance, involving the principal features of five battleships much larger than any previously undertaken by us, practically equal in size to the largest in the world, and to cost, complete, in round numbers, $30,000,000. Of the two plans before the board, one must be the better, and I believe that we should build all five vessels upon it, or if there is any reasonable plan, we should spare neither time nor cost to determine this point, obtaining incidentally the by no means small advantages of uniformity in the construction of five such important vessels. We have four turrets on two vessels of the superimposed principle, which are complete and in working condition. Tests made with these turrets so far have practically no bearing on the essential points at issue. While all of these points cannot be decided by tests, many of them can, and I believe that if thorough and exhaustive experiments were carried out by this or some other equally representative board upon each of the four superimposed turrets of the Kearsarge and Kentucky, the board would then be practically unanimous in finally accepting or rejecting the superimposed principles for our battleships. To divide these vessels between two types is to definitely advertise to the world that, although we have completed two superimposed turret vessels, we do not know whether or not they are better than if they had been built with separate turrets. I believe that we are at last in a position to settle this question, which has been such a vexed one in the navy for five years, and that such settlement should be no longer delayed."

STEEL PLANT AT THE SAULT.

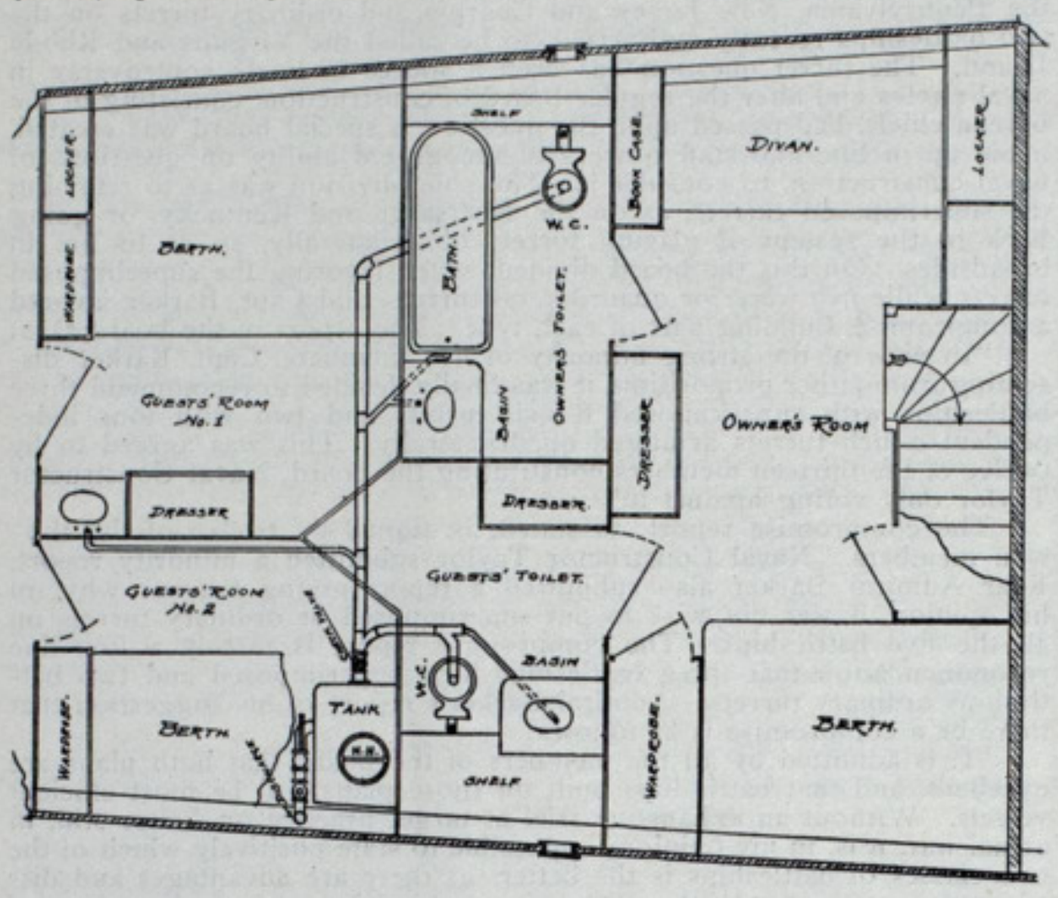
Francis J. Clergue of Sault Ste. Marie, Ont., representing the Lake Superior Power Co. and allied corporations engaged in a large water power development and the opening up of iron mines near the Sault, has communicated with various engineering firms recently concerning its proposed blast furnace and steel plants, of which mention has been made among other enterprises under Mr. Clergue's direction from time to time. The statement is now made that a blast furnace of 400 or 500 tons daily capacity will probably be built, and a Bessemer plant, plate mill and merchant bar mill. No mention is made of an open-hearth plant, but this will be a necessary part of the plant if plates are to be manufactured. It is stated that if the work is undertaken it will be the aim to have the plant in operation, in part at least, within a year. Since the power company, as is well known, is making a large installation of water wheels for the utilization of the water power at the "Soo" rapids, it is evidently the purpose to utilize electricity to a considerable extent in the iron and steel works. Thus far no considerable amount of experience in the driving of mills by electricity has been accumulated, and in this respect the proposed plant might introduce some departures.

Isaac L. Rice, president of the Electric Boat Co. and the promoter of a large number of the electric enterprises in which storage power is used, announces that the company has begun work on the first of the Holland submarine boats which will be used by the United States navy. The appropriation for this was made at the last session of congress, and the Electric Boat Co. is now pushing matters forward, so that the new boat will be ready for the fall maneuvers. Mr. Rice says he expects the boat will be completed in five months.

It is stated that plans of a submarine boat to hold three persons have been recently submitted to the British admiralty. They were prepared by a British inventor and they will be reported upon by experts, after which a preliminary boat will be made. The size of these boats is somewhat smaller than either the French or American patterns.

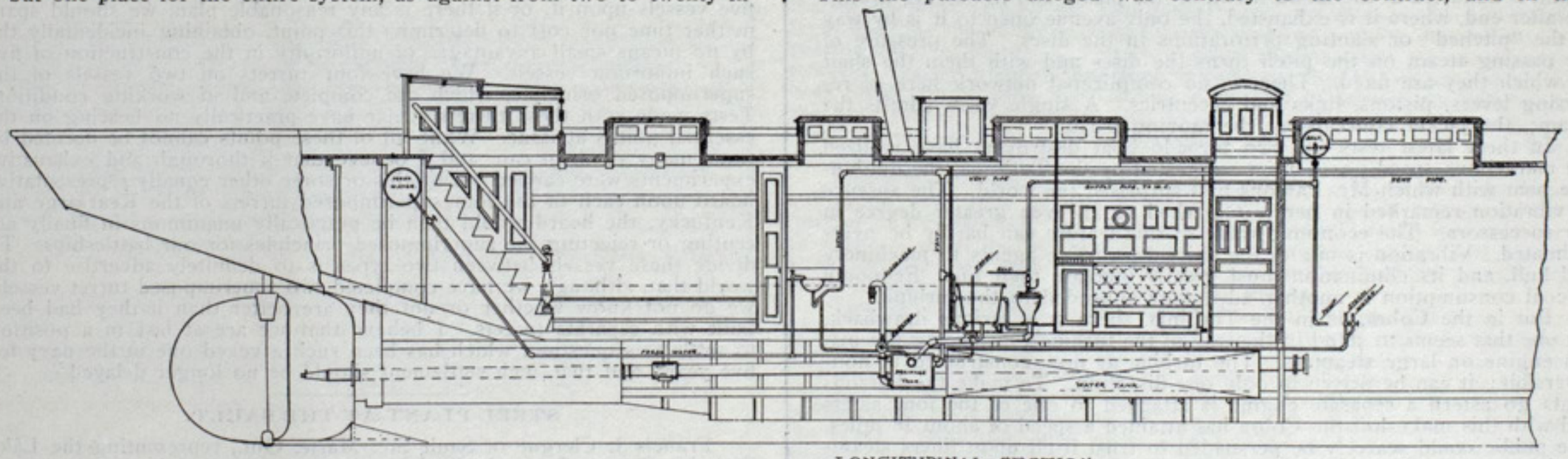
ELLIS MARINE PLUMBING SYSTEM.

There is shown herewith longitudinal section and plan of some plumbing recently placed in a new steam yacht by the Ellis Marine Plumbing Co., No. 32 Broadway, New York. This system has been placed in the Neaira, Saghaya, Marion and Carmen, and is also going into a number of new vessels now under way. It consists of a drainage tank, in the most convenient place on the vessel's bottom, a steam ejector, operated by float valves whenever the tank is filled, and suitable



PLAN SHOWING PLUMBING FIXTURES.

drains from all closets, bowls, sinks and other plumbing, all led to the tank. It offers the advantages of allowing the owner to use in his vessel any plumbing that he can use in his house on shore. Perfect ventilation is provided and the whole system becomes sanitary. Where the Kenney Flushometer is used on closets, etc., the system weighs less and is more quiet than the ordinary pump closets. Water may be supplied by gravity or pressure or both, as desired means are provided for emptying the tank when steam is not in the boilers, and the ship's side is pierced in but one place for the entire system, as against from two to twenty in



LONGITUDINAL SECTION
SHOWING PLUMBING

the old systems. The loop shown between the sea valve and the check valve on the ejector pipe is carried above the water line and prevents sea water flooding the tank in case of accident, while allowing the sea valve to remain normally open. All pipes shown in the drawings are covered and the effect is that of house plumbing.

Many sets of this apparatus are in daily use in hotels, apartment houses and public buildings in New York City, where sub-cellars are below the sewer line, and the economy and reliability, with the freedom from odor, has caused the prominent Atlantic steamship companies to seriously consider installing it on their passenger steamers.

ISSUING INVITATIONS FROM PARIS.

The following invitation, written in French and issued from Paris, is being sent to manufacturers in all parts of the world by President E. N. Hurley of the Standard Pneumatic Tool Co. of Chicago:

"You are cordially invited to visit at the Paris Exposition the exhibit of our products in the machinery department at the Champs de Mars and Vincennes park. It consists of a complete installation of pneumatic machines in operation, showing the great variety of work to which these tools and pneumatic accessories may be adapted. While at the exposition, we hope you will be able to visit our installation, which no doubt will be very interesting to you. We will be happy to be at your disposal and to give you all the information you may desire."

The Nickel Plate road will sell excursion tickets for the 4th of July at one fare for the round trip, within a radius of 200 miles, good going July 3 and 4 and returning until the 5th inclusive. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 107, June 28

CAMBERING OF STEAMSHIP'S KEELS.

HEAVY JUDGMENT AGAINST SHIP BUILDERS—HIGH COURT DECISION IN A CASE THAT WILL PROVE OF SPECIAL INTEREST TO NAVAL ARCHITECTS.

From a correspondent in England.

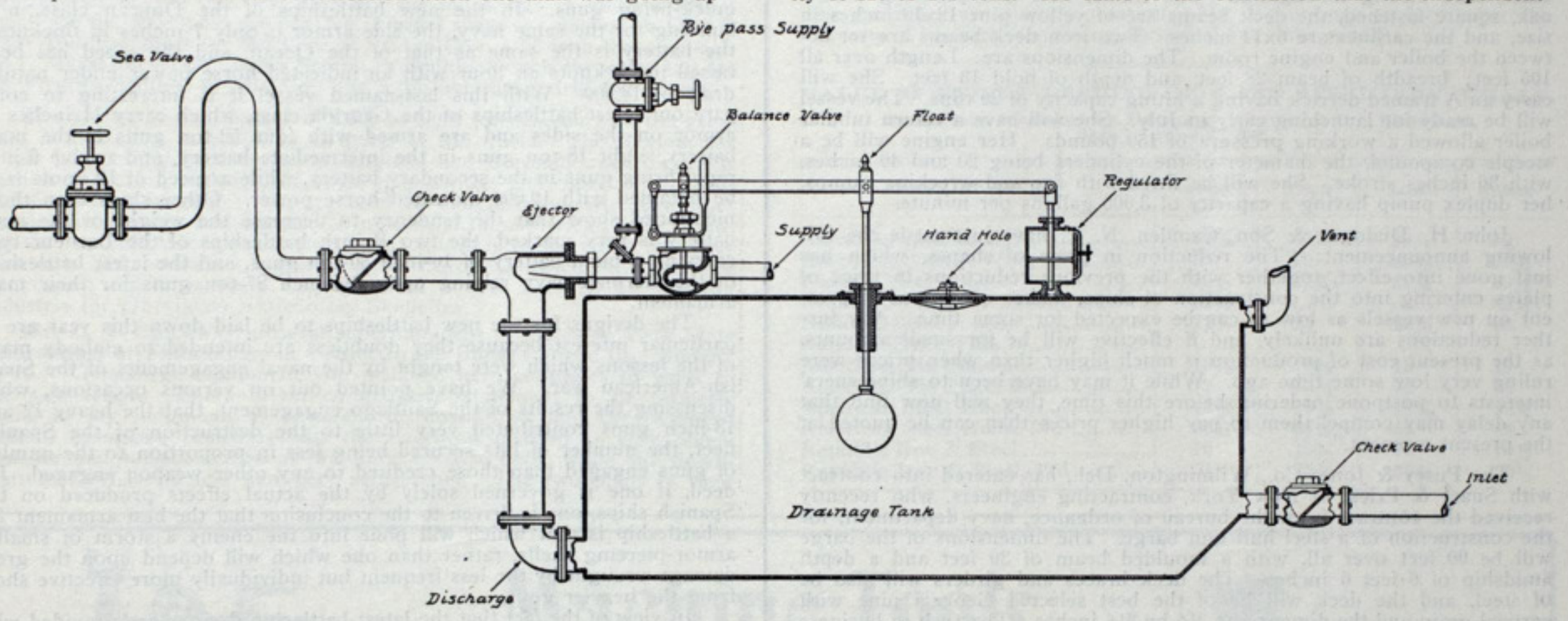
In the House of Lords—present the lord chancellor, Lords MacNaghten, Morris and Davey—judgment was given in the appeal from the first division of the court of session by Burrell & Son, ship owners, Glasgow, in the action at their instance against Russell & Co., ship builders, Port Glasgow. According to the appellants, a contract was entered into between the parties in 1893, under which the respondents built four steamers for the appellants. It was subsequently found that all the vessels had permanent cambers or arches in their keels, which prevented them from sitting fairly on ordinary blocks, and accordingly added to the risk and cost of docking them. The appellants maintained that the defect was a very serious one, and they sued the respondents for £40,000. They contended that it was the universal practice to build iron and steel steamships with absolutely straight keels. The contract did not specify that the keels should be straight, no more did the contract for building a house specify that the walls should be plumb, but the plans and models showed the vessels with straight keels. The appellants also alleged breach of contract as to the co-efficient of fineness and as to the draught. The respondent replied that the steamers were built with cambers, as was a common practice, and were so built at the sight and to the instructions of the appellants. The co-efficients of fineness were to conform to contract, and the respondents did not contract for any given draught. The appellants took delivery in full knowledge of the camber, of the draught, and of the co-efficients. The appellants had failed to show that any damage was suffered in consequence of the alleged breaches of contract. The court of sessions assoilzied the respondents, and the appeal was taken. The arguments recently heard before the House of Lords occupied eleven days.

The lord chancellor, who gave the leading judgment, said that this was an action upon a contract whereby the pursuers agreed to take and the defenders agreed to deliver for an agreed price four large steamers. The contract was in writing, and no dispute arose as to the construction of the contract itself. In some cases a question might arise whether plans intended to show the subject of the contract had been sufficiently incorporated into it as to make each part of the plan the expression of a contract obligation. No such question could arise here, because by the express language of the contract itself the plans were made a part of the contract. In this case it was undoubtedly true that the ships were received and accepted without complaint. But it was also true that within quite a reasonable time complaint was made. It was also true that there was a singular taciturnity on the part of the defenders in replying to the complaint. He might, in what he had further to say, speak of the subject matter of the contract as if it were only one ship, but it will be understood that the same observations were intended to apply to all four. The first complaint made by the pursuers was that the ship was cambered. This the pursuers alleged was contrary to the contract, and in this allegation they were borne out by the plan, which showed a straight keel, and which was undoubtedly part of the contract. It had hardly been suggested that any ship was intended to have a cambered keel when it was trading. The utmost that had been established by the evidence was that in the actual process of building, and in order to produce the ultimate result of a straight keel, a small camber might be devised so as to counteract the tendency of what was called "sagging" arising from the greater weight which the ship was subjected to amidship, but it did not appear to be gravely disputed that a permanently cambered keel for a vessel when actually trading, and after the process of building had been completed, would be a serious defect. Under these circumstances it might be well contended that, even if no express contract had been entered into, the defenders were bound to deliver a ship which should have a straight keel, and not one subject to such danger and inconvenience as would be involved in keeping a cambered keel. He could not doubt that it was established by an overwhelming body of testimony that the keel was cambered, and cambered to a very considerable extent. He was, therefore, of opinion that the pursuers had established prima facie, at all events, a cause of action against the defenders. The defenders alleged that the steamers were built with cambers, as was matter of common practice, and were so built at the sight and to the instruction of the pursuers. As mater of law, his lordship was of opinion that it was not competent to vary a written contract in the way that the defenders suggested that the written contract was varied; and it would be impossible to illustrate better the danger of permitting a written contract to be so varied than by pointing to the evidence in this case, and, apart from the question of law, he entertained no doubt whatever that the evidence the defenders had offered on this subject was wholly insufficient to establish the proposition that they were freed from their contract obligation to supply a straight keel, even if by law such evidence could avail them.

This was a contract of a very important character between ship builders of high commercial reputation and owners who desired to have what was at the time of this contract the largest cargo ship in the world, the contract price being upwards of £160,000. It was not denied that the ship if it retained the camber would be subject to great inconvenience and danger. It was not denied that the giving this vessel a camber at all as a steamer and not a sailing ship was an experiment, and it was gravely put forward that this serious experiment, and one on so great a scale which in a steamer had never been tried before by the defenders, was suggested and agreed to between the parties without a single line in writing from the commencement to the close of the transaction, although the contract was minute and specific in its written terms. The owner, who applied to experienced ship builders of great reputation, was supposed to have taken upon himself the risk of instructing the ship builders in their own business and informing them how they were to perform their contract, which involved the delivery to them of vessels with straight keels, and this, though subjects of far less importance and gravity, were matter of written correspondence and negotiation during the very period when the vessels were being built, and the builders were supposed to have acted without a single line to protect themselves if the experiment failed. It would require very cogent evidence to convince one that any such arrangement was made, and certainly the sort of evidence tendered could not be so described. The difference between a ship with six or seven bulkheads, such as these vessels, and a sailing vessel with only a few could not possibly have passed unnoticed by those who were agreeing to try a new experiment, and yet the only evidence which it was suggested could have called the attention of the ship owner to such a question was a casual conversation when one man was going upstairs and the other coming down on a staircase, and while passing a few words interchanged. Such a condition of things as was thus insisted on by the defenders was absolutely incredible. It was very likely some loose conversation passed upon the subject of other ship builders and the ships they were building, and that some of the witnesses had partly heard and partly misunderstood, and after an interval of years misrepresented unintentionally. It would justly be asked what motive could the defenders have had in trying this rash experiment. The answer of the pursuers, corroborated in more than one way, was that a mistake had been made with reference to the carrying capacity of the vessel, and that the cambering was intended to compensate for that mistake, and to make up the carrying capacity to the contracted amount; and it was both proved and admitted that it had had that effect. The mistake, which was but faintly contested, was made by a person by the name of Hutchinson. He was the foreman draughtsman to the defenders, and he prepared the plans of the four vessels in question. Of course, the plans would be the most satisfactory evidence of their design, and Mr. Hutchinson was in the possession of the plans, for which he was himself responsible. After this litigation had begun he received notice in due course to produce them, and what followed upon that notice was absolutely conclusive of the truth in this case. The dispute between the parties in respect of the camber had been narrowed to the question of whether or not it was 4 or 4½ inches, or was as much as 8 inches. The bulkheads as laid down in the plans would have an important and almost conclusive bearing upon the dispute in question. Mr. Hutchinson, familiar, of course, with the question, familiar with the dispute, and familiar with the effect which the evidence of the plans would have on this issue, mutilated the plans with the view to their production. The longitudinal plan, which had been in one piece, he cut in half. The ends which showed the bulkheads fore and aft he cut from the lower half of the plan, and thus divided and redrew the bulkheads from the finished lines of the vessel. The object of dividing the plan into two was apparently to conceal the fact that the bulkheads had been cut off at each end, since, if the plan had been preserved without being cut into two pieces, it would at once have been apparent that something had been cut off at each lower corner of it, but when thus divided it would avoid suspicion that anything had been suppressed. But even thus mutilated, the plan showed a pencilled line which had been erased as far as it was possible to erase it, and that pencilled line it could not be denied showed 8 inches of camber. His lordship came very firmly to the conclusion that a camber of 8 inches or thereabouts was established. Mr. Hutchinson's object was plain and palpable. He endeavored to conceal the line showing the 8 inches of camber and the bulkheads, which, if allowed to remain according to the original plan, would be inconsistent with the case that he was supporting. He knew better than any of their lordships could know how much would be disclosed by those plans if he had not tampered with them, and how important was their destruction, and he was responsible for the original mistake. His action was a gross and wilful perversion of the truth.

It appeared to his lordship that the first proposition of fact in this case, that the ship was dangerously cambered and contrary to the provisions of the contract, was established. The ship owners next complained that the co-efficient of fineness had been exceeded, and it appears that the time and circumstances under which the dispute originally arose were not without their importance. As early as September, and before the model sent by the defenders to the pursuers was in turn submitted to a naval architect to report upon, he reported that the co-efficient of fineness contracted for had been greatly exceeded, being .781 instead of the contract .770. The correspondence which ensued proved that the defenders had found out that they had made a mistake in their contract. Having discussed some of the technical evidence on the point, his lordship said he could not hesitate to prefer the calculations of the appellants' experts to those of Mr. Hutchinson, and it was not denied that a difference of co-efficient between .78 and .79 represented an additional carrying capacity of 120 to 170 tons. He came to the conclusion that the independent evidence showed that in respect of the co-efficient the defenders had been guilty of a serious breach of contract. Assuming the right of the pursuers to recover, it was a somewhat embarrassing position for their lordships to determine the amount of damages they were entitled. The expense of remedying the camber was not all to which the pursuers were entitled, and it was upon the rest of the case which was more or less speculative that the great difficulty arose. It was proved that a vessel with a false keel was not as good a marketable article as one built without that defect. It was proved that the co-efficient of fineness provided for by the contract had not been supplied, and it appeared impossible to say that where skilled persons had stipulated for a particular co-efficient of fineness with reference to speed, symmetry, and economical drawing of the vessel a breach of the contract in that direction could be regarded as altogether immaterial, and only to be treated as though the damages in respect of the breach were merely nominal. The exact depth, though not of itself a breach of any contractual obligation, was nevertheless one of the injurious consequences resulting from the camber. The misfortune was that each side regarded it as necessary to enhance or diminish the damages by somewhat exaggerated calculation. It appeared to his lordship that both views were absolutely unreasonable. He believed all their lordships agreed with him that, taking all the heads of damage together and the cost of the efforts to remedy the defects, they would be right in assessing the damages at £16,000. He therefore moved that the interlocutor appealed from be reversed, and that the judgment be entered for £16,000; the respondents to pay to the appellants their costs both here and below.

Lords MacNaghten, Morris and Davey concurred, and the lord chancellor intimated that Lord Brampton, who had taken part in the hearing, but who was now unable to be present, was of the same opinion. Their lordships accordingly unanimously sustained the appeal, and awarded the appellants £16,000 damages, with costs.



One fare for the round trip within a radius of 200 miles on the Nickel Plate road on July 3 and 4. Tickets good returning until the 5th, inclusive. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, or E. A. Akers, C. P. & T. A., Cleveland. 106, June 28.

AMONG THE SHIP BUILDERS.

NOTES FROM BOTH COASTS REGARDING NEW VESSELS—ONE FIRM CLAIMS THAT STEEL FOR SHIPS IS NOW AT BOTTOM PRICES.

Henry Cossey, at his yard at Twenty-fifth street, Brooklyn, is building a grain barge for W. R. McClellan. She is 95 feet in length, 26 feet beam, and 12 feet depth of side. She is built of yellow pine with an oak bow, and is galvanized fastened. Four heavy wale strakes are inserted in each side of hull, giving additional strength and durability to the hull. Mr. Cossey has also started work on a brick barge for the Underhill Brick Co. Her dimensions are: Length 112 feet, beam 32 feet, depth 9 feet amidships. She will carry 800 tons. About 100,000 feet of yellow pine will be employed in her construction. Mr. Cossey is building the sections for the docks of the Tietjen & Lang Dry Dock Co., four of which he has delivered at Hoboken, the fifth being under way. He has also contracted with the Morse Iron Works & Ship Building Co. to build the sections for their large dock. He is putting up the dry docks at his yard at Verplanck's Point on the Hudson. At this yard he has storage room for 2,000,000 feet of timber and can also build two sections of the dry dock at one time, having extensive water frontage and good depth of water there.

Jakobsen & Peterson, Brooklyn, N. Y., have on the stocks at their yard a combination towing derrick and lighterage steamer which they are building for the Hudson River Lighterage Co. The vessel is being built extra strong throughout. The frame, keel and planking are of oak, square fastened, the deck beams are of yellow pine 12x12 inches in size, and the carlines are 6x12 inches. Two iron deck beams are set between the boiler and engine room. The dimensions are: Length over all 105 feet; breadth of beam 28 feet, and depth of hold 13 feet. She will carry an A framed derrick having a lifting capacity of 20 tons. The vessel will be ready for launching early in July. She will have a return tubular boiler allowed a working pressure of 150 pounds. Her engine will be a steeple compound, the diameter of the cylinders being 20 and 40 inches, with 36 inches stroke. She will be fitted with fire and wrecking pumps, her duplex pump having a capacity of 3,000 gallons per minute.

John H. Dialogue & Son, Camden, N. J., have just made the following announcement: "The reduction in price of shapes, which has just gone into effect, together with the previous reductions in price of plates entering into the construction of ships, makes quotations at present on new vessels as low as can be expected for some time. Any further reductions are unlikely, and if effective will be for small amounts, as the present cost of production is much higher than when prices were ruling very low some time ago. While it may have been to shipowners' interests to postpone ordering before this time, they will now find that any delay may compel them to pay higher prices than can be quoted at the present moment."

The Pusey & Jones Co., Wilmington, Del., has entered into contract with Snare & Priest of New York, contracting engineers, who recently received the contract from the bureau of ordnance, navy department, for the construction of a steel hull gun barge. The dimensions of the barge will be 90 feet over all, with a moulded beam of 30 feet and a depth amidship of 6 feet 6 inches. The deck braces and girders will also be of steel, and the deck will be of the best selected Georgia pine with vertical grain and the dimensions 3½ by 3½ inches. The rush of business with Pusey & Jones is so great that the company is considering the advisability of extending its works.

At the Sewall yard, Bath, Me., work was begun last week on the keel for one of the two steel ships to be built for the Standard Oil Co. The framing will be begun in about a week. A schooner arrived June 10 with 560 tons of material, including the keels for both ships and the frame for the first ship to be built. Both stern posts and rudders are in the yard. The rudders are steel, consisting of two pieces and go together with lock joint, similar to the rudders used on the European steamships. The ships will each measure 320 feet on keel. They will be ready for commission about the first of next year.

At the Union Iron Works, San Francisco, the battleship Wisconsin and the three torpedo boats Preble, Perry and Paul Jones are nearly completed, and the big steamer Californian of the American-Hawaiian line will be ready for her trial trip in a few days. The battleship Ohio will be completed in the fall. The keel of the cruiser Tacoma will be laid soon; also the keel of the Santa Fe Co.'s new ferryboat San Pablo.

The Boyer water-tube boiler placed in the New York police patrol boat Lannan by the Atlantic Iron Works was tested last week by the United States inspectors and found in every way satisfactory.

It is reported that the North German Lloyd Steamship Co. has commissioned the Vulcan Shipbuilding Works at Stettin to construct for its New York line two of the largest steamships in the world.

THE BATTLESHIP OF THE FUTURE.

A comparative study of the designs of the new battleships which figure in the naval program for the year 1900 shows that naval constructors, both in our own and foreign navies, are rapidly tending toward a common type, which, without exaggeration, may be defined as a complete reversal of the ideas of battleship design and construction that have been prevalent during the last ten or fifteen years. In the last of the eighties and in the early nineties of the century, the typical battleship was essentially of what we may call the bulldog type, compared with which the battleship of the opening years of the twentieth century will be a greyhound in speed and activity, while still retaining not a little of the bulldog's fighting power. The bulldog type, for want of a better expression, is characterized by a hull of bulky model, short and broad; a slow speed of say from 14 to 16 knots; armor of excessive thickness, ranging from 21½ inches in the French Baudin and the Italian Duilio, and 24 inches in the British Inflexible, to 18 inches in our own Indiana and Oregon; and an offensive battery of a few heavy, unwieldy and slow-firing guns, which weighed as much as 110½ tons apiece in the British Benbow and the Italian Duilio type.

During the past fifteen years there have been three important developments in naval material which have served completely to revolutionize battleship construction. The first of these is the advance that has been made in the methods of armor-plate construction, by which increased resisting power has been obtained with a great reduction in weight. The next is the improvement in the manufacture of guns and explosives, which has been so great as to enable us to secure equal penetration with a gun weighing only half as much as those of the earlier type. The third development has been in the design and materials of boilers and engines, the improvements in which have enabled us to secure a great reduction in engine and boiler room weights, and, at the same time, obtain an increase of from 40 to 50 per cent in the speed of the ship.

A mere recital of the leading particulars of the notable battleships of the British navy of the past two decades tells the story of this development. The Inflexible of the year 1881 was clothed with 24 inches of armor, carried four 16-inch muzzle-loading 80-ton guns, and attained a speed of 12.8 knots with 6,500 horse power. The Camperdown of 1889 carried 18 inches of armor, mounted four 67-ton guns in her main battery, and attained a speed of 16 to 17 knots with a horse power of 11,500. The Majestic, designed in 1892, carried 9 inches of armor on her side, was armed with four 12-inch 50-ton guns in her main battery, and attained a speed of over 18 knots with about 13,000 indicated horse power. The Ocean, completed in the present year, has 6 inches of armor on her belt, carries a main battery of four 50-ton guns, and has attained a speed of 18½ knots with about 14,000 indicated horse power.

In the foregoing statement no mention has been made of the fact that with the decrease in the weight of the main battery there has been a notable increase in the secondary battery of rapid-firing guns, the Ocean carrying twelve 6-inch guns of this type, in addition to eighteen smaller quick-firing guns. In the new battleships of the Duncan class, now building for the same navy, the side armor is only 7 inches in thickness; the battery is the same as that of the Ocean, and the speed has been raised to 19 knots an hour with an indicated horse power under natural draft of 18,000. With this last-named vessel it is interesting to compare our latest battleships of the Georgia class, which carry 11 inches of armor on the sides and are armed with four 52-ton guns in the main battery, eight 18-ton guns in the intermediate battery, and twelve 6-inch rapid-firing guns in the secondary battery, while a speed of 19 knots is to be obtained with 19,000 indicated horse power. Other ships than those mentioned show that the tendency to decrease the weight of the main battery is very marked, the two British battleships of the Barfleur type carrying a main battery of 10-inch 30-ton guns, and the latest battleships of the German navy relying upon 9½-inch 27-ton guns for their main armament.

The designs for the new battleships to be laid down this year are of particular interest because they doubtless are intended to embody many of the lessons which were taught by the naval engagements of the Spanish-American war. We have pointed out on various occasions, when discussing the results of the Santiago engagement, that the heavy 12 and 13-inch guns contributed very little to the destruction of the Spanish fleet, the number of hits secured being less in proportion to the number of guns engaged than those credited to any other weapon engaged. Indeed, if one is governed solely by the actual effects produced on the Spanish ships, one is driven to the conclusion that the best armament for a battleship is that which will pour into the enemy a storm of smaller armor-piercing shells, rather than one which will depend upon the great damage wrought by the less frequent but individually more effective shots from the heavier guns.

In view of the fact that the latest battleship designs are provided with armor of from 6 to 9 inches in thickness, and that to secure destructive effects it is sufficient that a shell shall merely penetrate the enemy's armor, it begins to look as though the 12-inch 50-ton slow-firing gun is at once too powerful and too slow for the work which it will be called upon to do. It becomes a question whether the destructive effect of a given number of 12-inch shells would not be exceeded by four times the number of 8-inch shells, any one of which would be capable of penetrating the armor of the latest type of battleship. It is evidently these considerations which have led to the design of the new battleships for the Italian navy, which, on a displacement of 8,000 tons, and with armor of a maximum thickness of 6 inches, are to carry no gun heavier than the 8-inch; the main battery consisting of twelve of these very effective weapons carried in pairs in six separate turrets, disposed on the same plan as that adopted in our own battleship Iowa. The secondary battery consists of twelve 3-inch rapid-fire weapons. These 8-inch guns are to be of extremely high velocity, and their rapid-fire mechanism will enable them to fire at the theoretical rate of five shots per minute. Another remarkable feature in these ships is that they are built with very fine lines, and sufficient engine power to drive them 23 knots an hour. Possessing such great speed and maneuvering ability, a vessel of this type could steam swiftly within a range at which the enemy's armor would be penetrable by her 8-inch guns, where she would be able to concentrate no less than eight of these weapons, and pour in a storm of armor-piercing projectiles which might well demoralize the crew and wreck the gun positions of the enemy before his heavy armor-piercing guns could get in a disabling shot. It must be remembered, moreover, that two of these 8,000-ton vessels could probably be constructed for but little more than the cost of one of the 15,000-ton battleships of the kind that our own and the British governments are now constructing. It is probable that the predominant type of the next decade will approximate more to the latest Italian battleships than it will to any existing type today.—Scientific American.

The statement that the tow barge Aurora, rebuilt at Marine City, Mich., from the burned steamer of the same name, is the largest wooden vessel on the great lakes is incorrect. The Aurora was at one time the largest wooden vessel on the lakes, but there are now several wooden vessels of much greater capacity. The wooden schooner Chicamauga of Cleveland, for instance, is considerably larger than the Aurora, as she tons 2,472 gross and 2,399 net.

The Nickel Plate road will sell excursion tickets to Kansas City, Mo., account national democratic convention on July 1, 2 and 3, at one fare for the round trip, tickets good returning to and including July 9. Write, wire, 'phone or call on nearest agent, C. A. Asterlin, T. P. A., Ft. Wayne, Ind., or E. A. Akers, C. P. & T. A., Cleveland, O. 109, June 28.

TRADE NOTES.

Chas. E. Stamp & Co., New England Bldg., Cleveland, have been appointed Cleveland agents for the Northern Engineering Works of Detroit, manufacturers of cranes, air hoists and gas engines.

Mr. Spencer Miller, chief engineer of the Lidgerwood Mfg. Co.'s cableway department, sailed June 23 on the Patricia of the Hamburg-American line, for Europe. Mr. Miller will be accompanied by Mrs. Miller and goes abroad in the interests of his recent invention for coaling warships at sea.

The boiler plant of the Kingsford Foundry & Machine Works, Oswego, N. Y., is running with a full force of men, while the machine department is extremely busy on centrifugal pumping machinery and vertical, stationary and marine engines. Recent shipments of large pumps have been made to Japan, Mexico and the Cape Nome district, at which latter place they are used on the beach for dredging purposes.

For artistic half-tone illustrations and clear descriptions of high-class pumping machinery, especially marine pumps, the catalogues of Dean Bros. Steam Pump Works, Indianapolis, Ind., are gems. The latest of these publications, just issued, is catalogue No. 38 dealing with duplex steam pumps, including the vertical marine or admiralty type made for heavy pressure and hard service, as well as horizontal and vertical bilge, ballast and circulating pumps.

A night force was recently put on by the Cleveland Punch & Shear Works of Cleveland and they are now getting out orders that were delayed by the recent strike of machinists. Among tools shipped by this company within the past few days are the following: A 20-inch throat punch for the Fairbanks Co.; a No. 1 bevel shear for Seiders & Co.; a heavy splitting shear for the Owego Bridge Co.; a 36-inch throat punch for I. Matheson & Co., Nova Scotia; a double 20-inch throat punch for the Virginia Bridge & Iron Co., and a 15-foot radial drill for export.

The towing of steel barges of 6,000 to 8,000 tons capacity on the great lakes is attracting attention in all parts of the world. The Review has of late had several inquiries from England and Germany regarding this method of moving bulk freight in great quantities and especially regarding the towing machines that are used to handle heavy wire tow lines between the steamer and barges. A note from the American Ship Windlass Co., manufacturers of the towing machines, is to the effect that they have also had numerous inquiries from European countries regarding the towing machines since they installed one in Sweden on the tug Industrie for Ohrvikens Aktiebolag, Skelleftea.

Mr. Z. R. Brockway, general superintendent of the New York State Reformatory at Elmira, says in a letter to the Buffalo Forge Co., Buffalo, N. Y.: "The forge equipment you installed here continues to work to our satisfaction. There is no comparative statement to be properly made, in my judgment, as between the down-draft and the overhead method of smoke removing, for the overhead method is very objectionable and unsatisfactory as we have used it here, while the down-draft method is efficient and very satisfactory. The two plans in their practical operation are so wide apart they ought not to be compared. If I were to intsall a new plant nothing would induce me to use the overhead method."

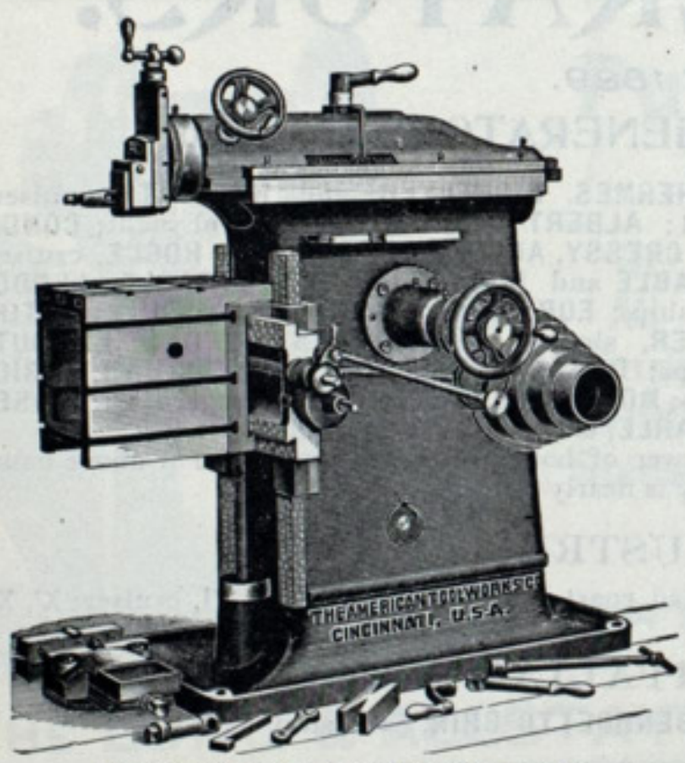
The Hancock Inspirator Co. has issued a new catalogue of 40 pages, 6 by 9 inches, devoted to the well-known Hancock inspirators of which they are the sole manufacturers, for stationary, marine and portable boilers. All the various types of Hancock inspirators are illustrated and described in detail, and much additional data of value is furnished in directions for connecting and operating, and price lists, which latter it has been found necessary to revise owing to the introduction of new goods. The book also shows the Hancock ejector, "Loftus" automatic injector, Hancock hydro-carbon burner, Hancock purge apparatus, Hancock shaking grate, valves and general jet apparatus which the company makes. Copies of the catalogue may be had upon application to the general office of the Hancock Inspirator Co., 85-87-89 Liberty street, New York.

Mr. Thomas P. Egan, president of the J. A. Fay & Egan Co., the large manufacturers of wood-working machinery of Cincinnati, left recently for Paris, sailing from New York on the American liner St. Louis. This well known firm is making a most elaborate display at Paris, and although the exposition can hardly be said to have fairly opened yet, the success already achieved and the praise and encomiums bestowed upon them for their enterprise and the completeness of their exhibit have been most gratifying. Their stands, in groups IV and V, United States section, both at Champ de Mars and Vincennes annex, cover about 3,000 square feet, and are located in a most advantageous position for illustrating what a complete line of wood-working machines will accomplish. The machines are all in operation. Mr. Egan goes to look after the interests of his firm, remaining abroad about three months.

VALUE OF STOCKS—LEADING IRON AND STEEL INDUSTRIALS.

Quotations furnished by HERBERT WRIGHT & Co., Cleveland, date of June 27, 1900.

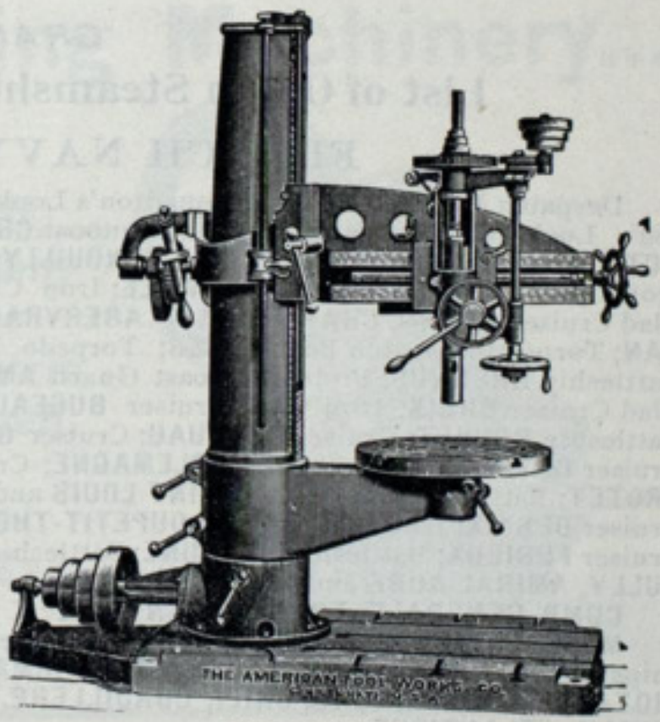
NAME OF STOCK.	OPEN	HIGH	LOW	CLOSE
American Steel & Wire	30½	30⅞	29⅞	30
American Steel & Wire, Pfd	70	70	69½	69½
Federal Steel	30½	31¼	30½	30½
Federal Steel, Pfd	62½	.....	.....	62½
National Steel	22½	23	22½	23
National Steel, Pfd	.....	.....	.....	.....
American Tin Plate	19⅜	19½	19	19
American Tin Plate, Pfd	72	73½	72	73
American Steel Hoop	18⅝	18⅞	18½	18½
American Steel Hoop, Pfd	66¼	66¼	66	66
Republic Iron & Steel	10	10½	10	10½
Republic Iron & Steel, Pfd	51	52½	50¼	52½



New 16″ Back Geared Crank Shaper.

Machine Tools

LATHES, PLANERS, SHAPERS,
BORING and TURNING MILLS,
UPRIGHT and RADIAL DRILLS,
SCREW MACHINES,
PULLEY LATHES,
BOLT CUTTERS, Etc.



3′ Radial Drill.

The American Tool Works Co.,

BUILDERS OF COMPLETE LINES OF MACHINE TOOLS,

WORKS: CINCINNATI, U. S. A.

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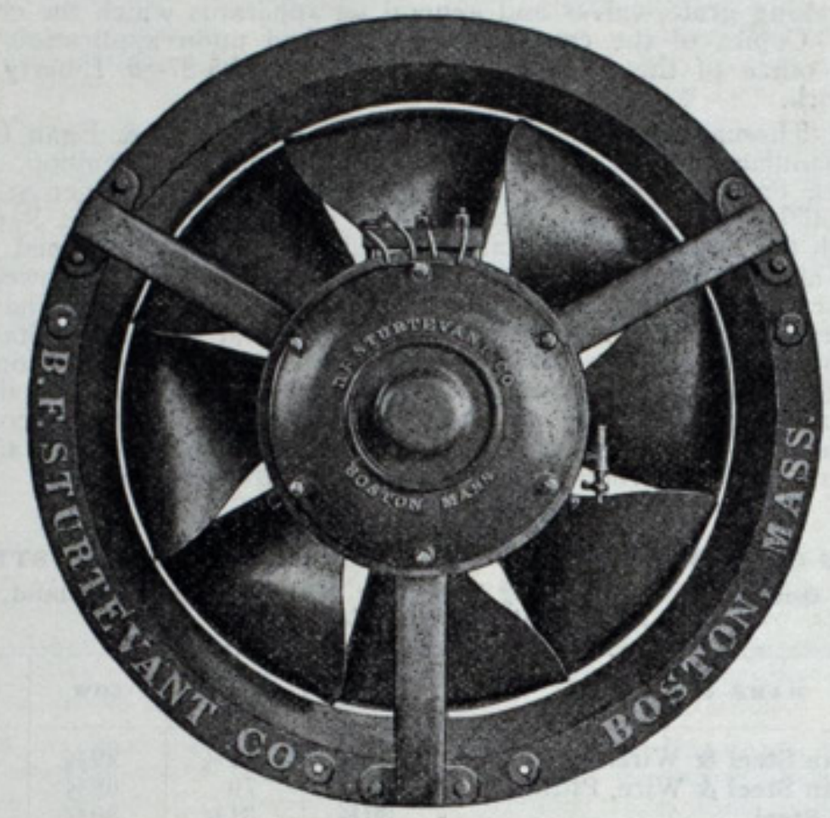
SOMETHING COOLING FOR A HOT DAY.

In the hot days of summer we realize most vividly how much we are dependent on the movement of the air to secure our comfort. It is not enough, however, to merely agitate the air with a fan but in most cases we are distinctly dependent upon a change in the atmosphere within the room, which can only be secured by forcing in the air or by withdrawing it by positive means and permitting a fresh supply to enter to make good the loss. For the purpose of securing such results an electric ventilating fan like that shown in the accompanying illustration is almost invaluable. It may be attached to an opening in the wall and arranged to force into or draw directly from the room, or it may be



connected to a system of air ducts through which movement is maintained.

The illustration shows a special type of electric ventilating fan, built by the B. F. Sturtevant Co. of Boston, Mass. The motor driving this fan is of the bi-polar type, entirely enclosed so as to protect it from dust. The end plates with removable centers, as shown in the illustration, serve to enclose the motor and still leave its parts readily accessible. One of the difficulties in designing an enclosed motor is to provide for the ready distribution of the heat generated by its operation. This end is secured in this type of motor first by careful designs so that a temperature rise of only 60° F. marks the limit at a run of ten hours, and second by the cooling effect of the large volumes of air continually drawn across the surface of the motor casings by the action of the fan. The motor is rigidly held and accurately centered within a tripod support which is attached to a cast iron ring. This ring contains the fan wheel, which is designed to deflect the air into line parallel with the shaft. The entire apparatus is shipped complete and can be readily attached where desired and electric connection made. These electric fans are built in sizes ranging from 18 inches to 120 inches in diameter, driven by motors ranging from 1-6 horse power to 14 horse power, according to size, and handling from 2,000 cubic feet per minute in the smallest plant up to 175,000 in the largest.

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The Japanese navy consists of ten first-class battleships, ten first-class armored cruisers and twenty fast protected cruisers, together with torpedo boat destroyers, gunboats, etc., which brings the total up to ninety vessels of all classes. This navy has been built since 1880. It is of the latest design and build, and is fitted with armament of the most modern character. One of the most recent additions is the Asahi, the offensive and defensive qualities of which are unexcelled.

The Naval Annual, published at Portsmouth, England, in comparing the navies of the world, estimates that at the close of the year the strength in completed battleships will probably be: Great Britain, forty-seven; France, thirty-four; Russia, seventeen. But, it is added, Great Britain's preponderance in modern powerful vessels will probably make her navy more than equal to the combined French and German navies.

CHARTS OF THE ST. LAWRENCE.—It frequently happens that owners of steam yachts passing between the lakes and the Atlantic want charts of the St. Lawrence river, and want them in a hurry. The Marine Review has them on hand all the time—complete from Lake Ontario to the Gulf of St. Lawrence.

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ENGLISH NAVY.

Torpedo Boat Destroyer **SHARPSHOOTER**; **POWERFUL** and **TERRIBLE**, iron clad cruisers; **GLADIATOR, ARROGANT, FURIOUS, VINDICTIVE**, cruisers; **NIOBE, DIADEM. ANDROMEDA, EUROPA**, cruisers; **CANOPUS, GLORY, GOLIATH, ALBION, OCEAN**, iron clad ships; **ARGONAUT, ARIADNE, AMPHITRITE, SPARTIATE, HERMES, HIGHFLYER** and **HYACINTH**, cruisers; **VENGEANCE**, iron clad; **ALBERT AND VICTORIA**, royal yacht; **CONDOR** and **ROSARIO**, sloops; **CRESSY, ABOUKIR, SUTLEY** and **HOGUE**, cruisers; **IMPLACABLE, FORMIDABLE** and **IRRESISTIBLE, VENERABLE, LONDON, BULWARK**, iron clad ships; **EURYALUS, BACHANTE**, cruisers; **MUTINE, RINALDO, SHEARWATER**, sloops; **CORNWALLIS, DUNCAN, EXMOUTH, RUSSEL**, iron clad ships; **DRAKE, KING ALFRED, LEVIATHAN, AFRICA**, cruisers; **VESTAL**, sloop; **MONMOUTH**, cruiser; **BEDFORD**, cruiser; **ESSEX, KENT**, cruisers; **ALBEMARLE, MONTAGUE**, battleships.

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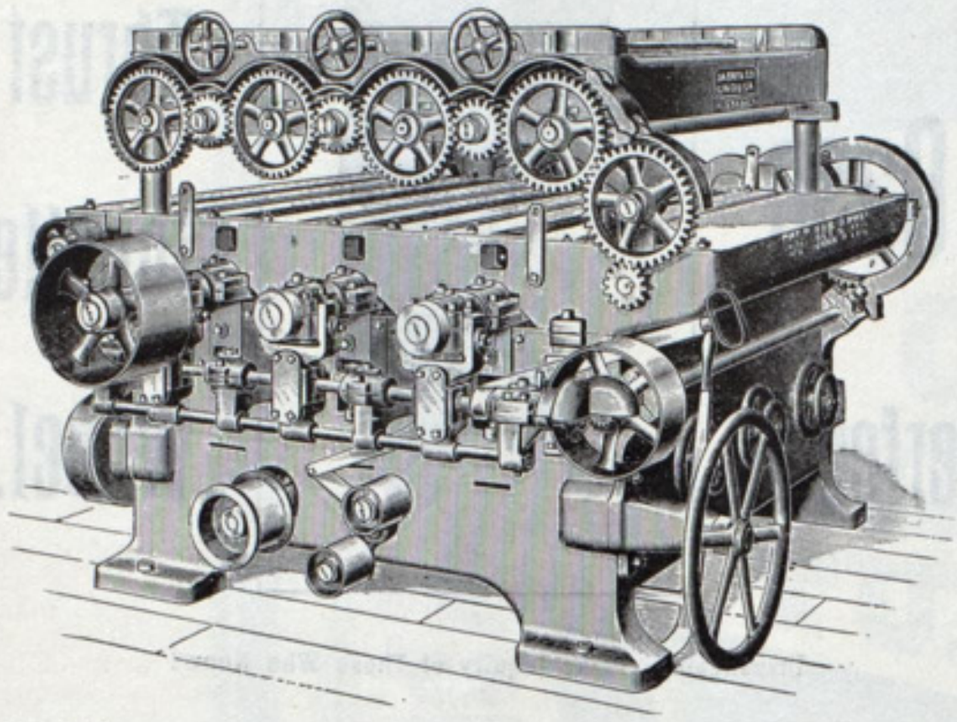
A machine recently introduced by the J. A. Fay & Egan Co. of Nos. 325 to 345 West Front street, Cincinnati, O., is illustrated herewith. It is known as the Fay No. 4 triple drum sander. This machine is invaluable where a perfectly smooth surface is required, either for varnishing or painting. It is very massive and substantial and combines in its construction all the improvements that an extensive experience could suggest. The three steel polishing cylinders, upon which the sandpaper



is placed, have a vibratory motion to prevent the formation of lines, and are equipped with a device for quickly applying the sandpaper and giving it the proper tension. The feed is very powerful, being driven by a train of heavy expansion gearing, and will receive material 8 inches thick. The pressure rolls are so arranged that adjustments may be made very readily, and the feed may be stopped or started instantly.

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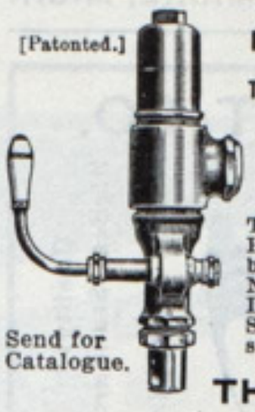

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Treasury Department, Office of General Superintendent U. S. Life-Saving Service, Washington, D. C., June 18, 1900. Sealed proposals will be received at this office until 2 o'clock p. m. of Thursday, the 12th day of July, 1900, and then publicly opened, for furnishing supplies required for use of the Life-Saving Service for the fiscal year ending June 30, 1901; the supplies to be delivered at such points in New York City, Grand Haven, Mich., and San Francisco, Cal., as may be required, and in the quantities named in the specifications. The supplies needed consist of Beds and Bedding; Blocks and Sheaves, Cordage; Crockery; Furniture; Hardware, Lamps, Lanterns, etc.; Lumber, Medicines, etc.; Paints, Oils, etc.; Ship Chandlery; Stoves, etc.; Tools, and Miscellaneous Articles; all of which are enumerated in the specifications attached to the form of bid, etc., which may be obtained upon application to this office, or to the Inspector of Life-Saving Stations, 17 State Street, New York City; Superintendent Eleventh Life-Saving District, Grand Haven, Mich.; and Superintendent Twelfth Life-Saving District, New Appraisers' Stores, San Francisco, Cal. Envelopes containing proposals should be addressed to the "General Superintendent U. S. Life-Saving Service, Washington, D. C.," and marked on the outside "Proposal for Annual Supplies." The right is reserved to reject any or all bids, and to waive defects, if deemed for the interests of the Government. Horace L. Piper, Acting General Superintendent. June 28

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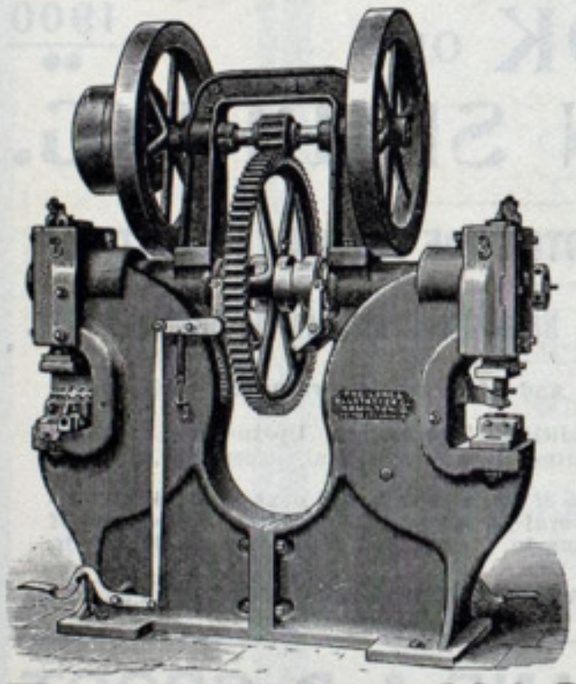

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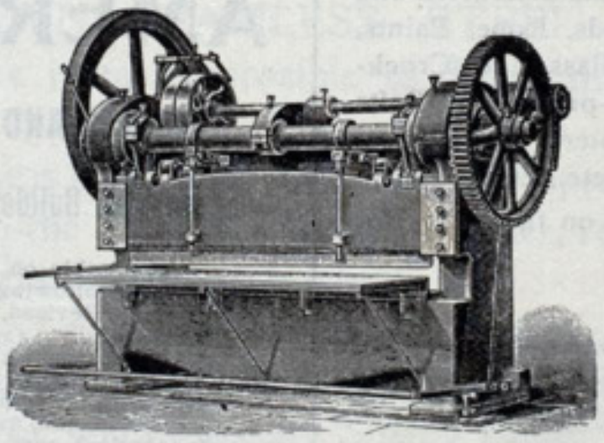

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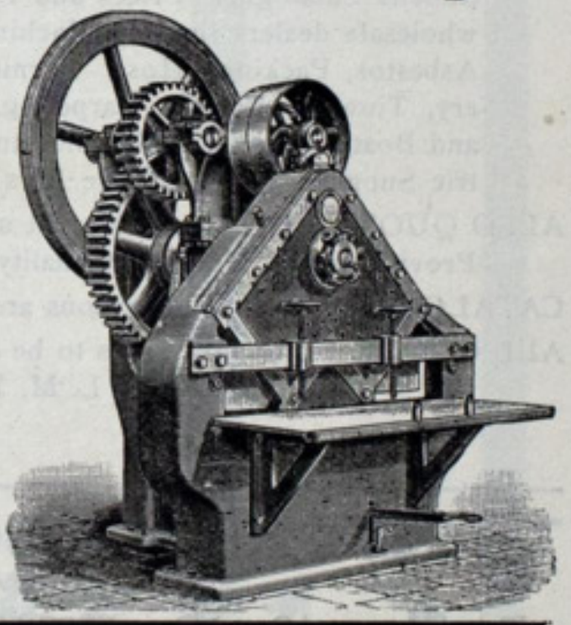

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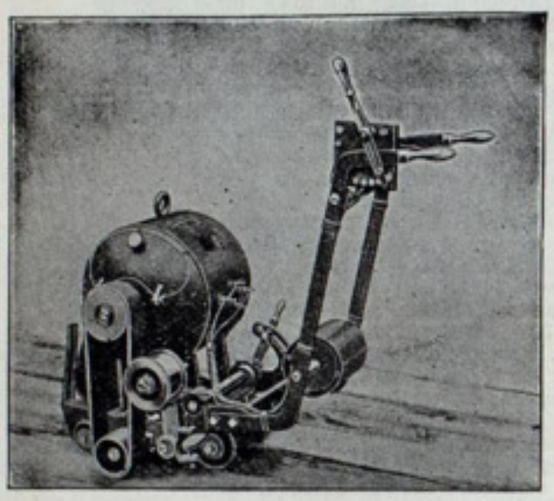

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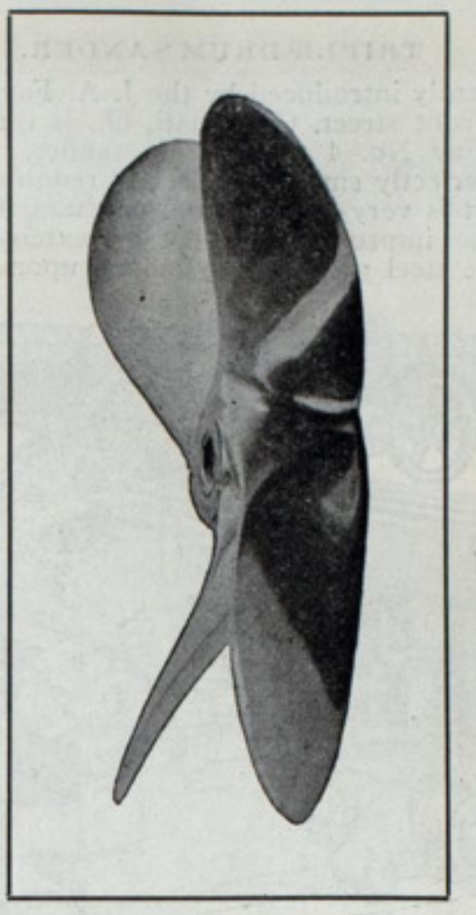

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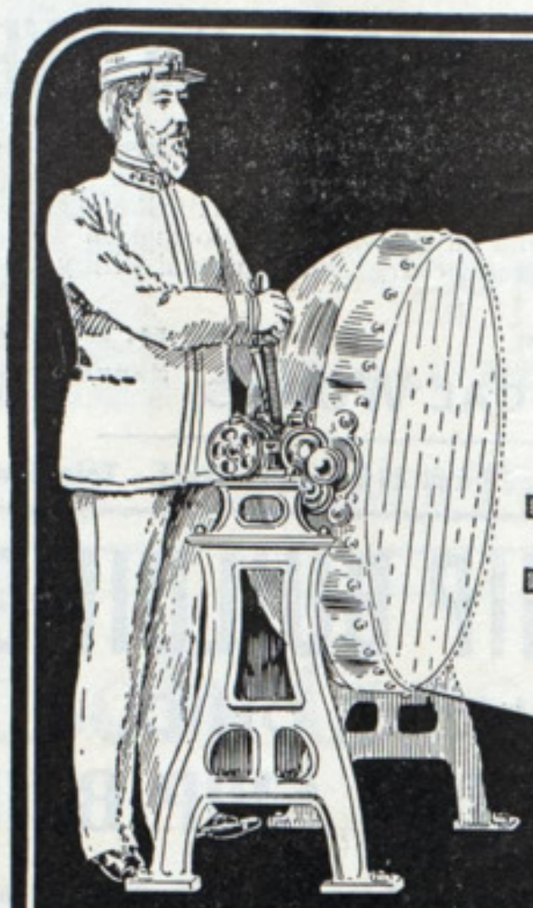

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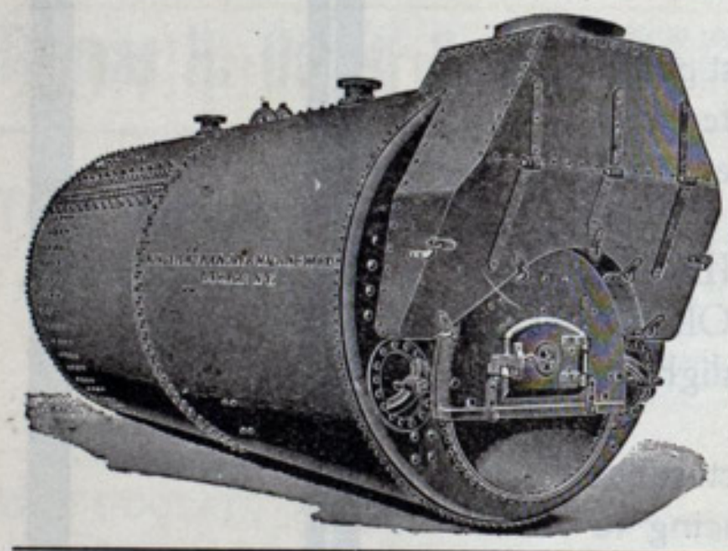

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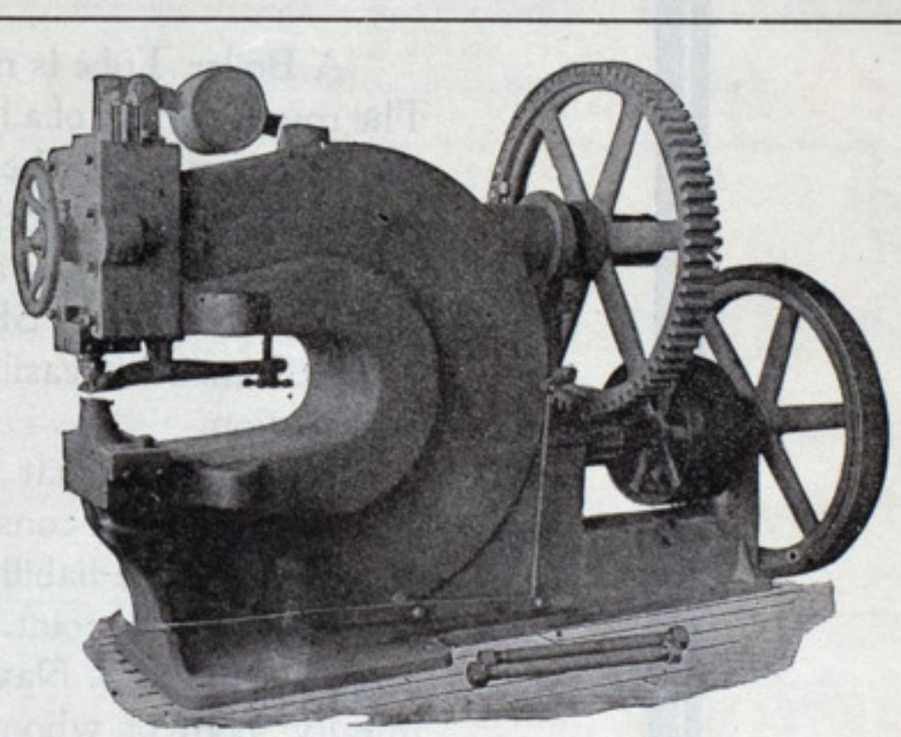

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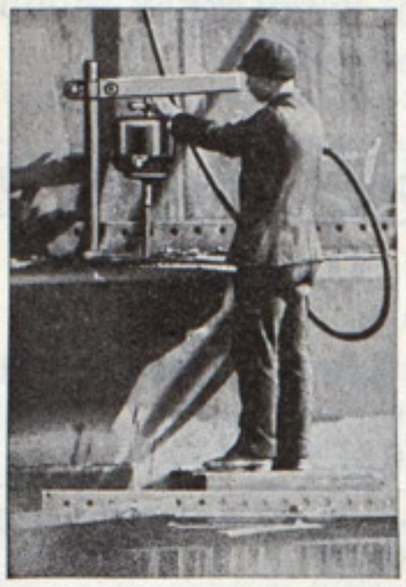

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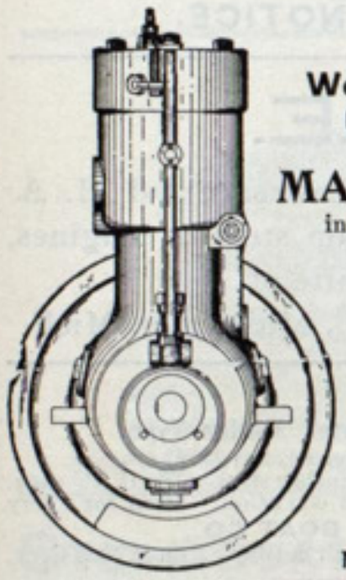

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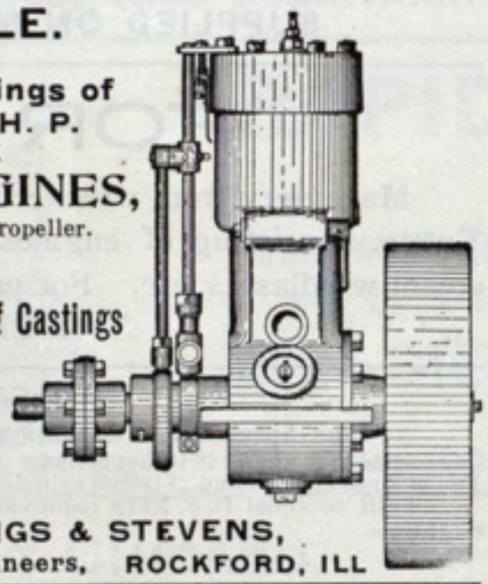

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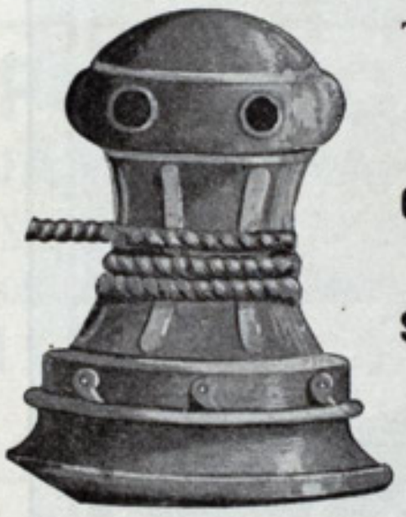

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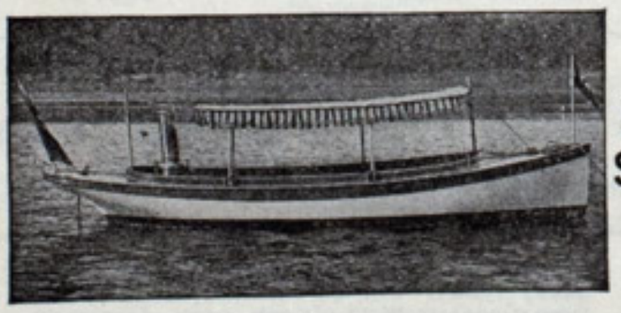

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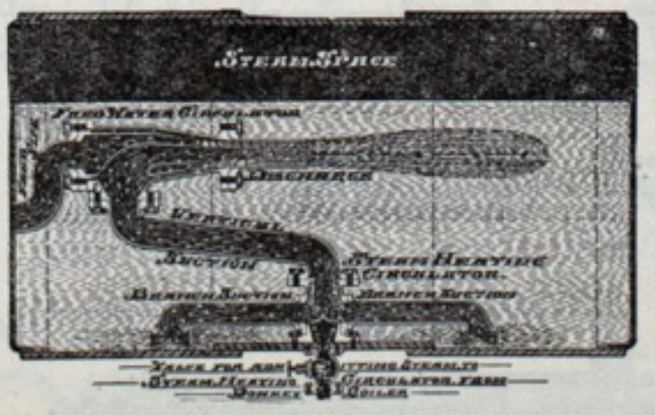

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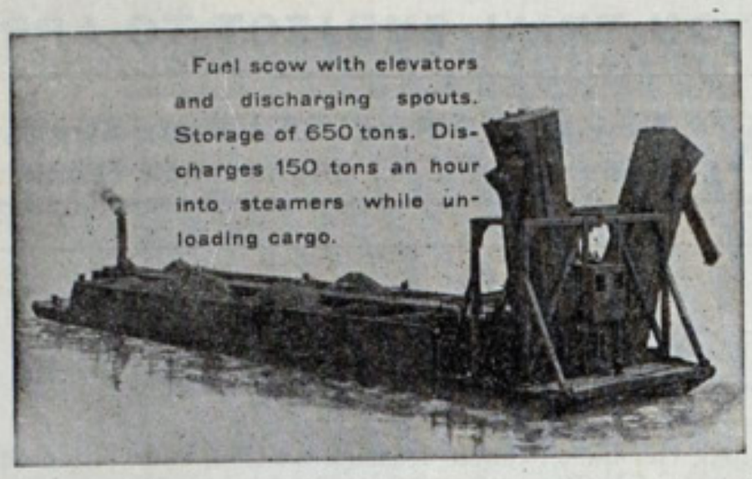

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U. S. Engineer Office, Buffalo, N. Y., June 20, 1900. Sealed proposals for construction of concrete superstructure on south pier at Buffalo, N. Y., will be received here until 11 a. m., July 10, 1900, and then opened. Information furnished on application. T. W Symons, Major, Engrs. July 5

Sealed proposals for furnishing armor for naval vessels will be received at the Navy Department until 12 o'clock, noon, August 10, 1900, when they will be publicly opened. Forms of proposals and all necessary information may be obtained from the Chief of the Bureau of Ordnance, Navy Department, Washington, D. C. F. W. Hackett, Acting Secretary. 6-18-1900. July 28

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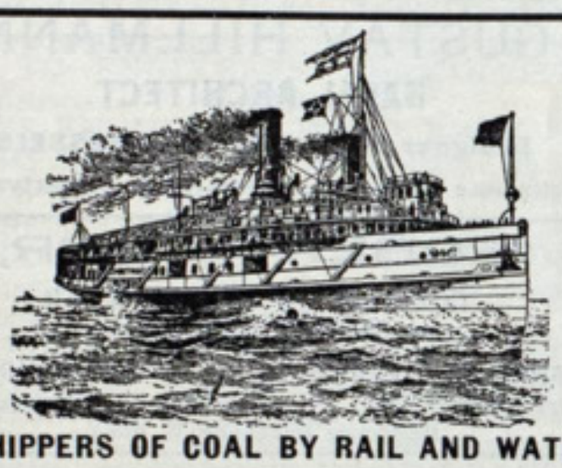

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Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Engine Co.....Weymouth, Mass
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
MacKinnon Mfg Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
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Newport News Ship Bldg. Co..Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd...Philadelphia.
Pusey & Jones Co.....Wilmington, Del
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
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Trout, H. G.....Buffalo.
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Rushmore Dynamo Works.....Jersey City, N. J.
Sprague Electric Co.....New York.
Westinghouse Electric & Mnfg. Co...Pittsburg, Pa.

SEPARATORS, (CENTRIFUGAL).
Keystone Engine & Machine Works, W. L. Simpson, Engineer.....Philadelphia.

SHAPERS.
American Tool Works Co. (The).....Cincinnati.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Engine Co.....Weymouth, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Iowa Iron Works.....Dubuque, Ia.
Jenks Ship Building Co.....Port Huron, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Morse Iron Works & Dry Dock Co.....Brooklyn.
Neafie & Levy Ship & Eng. Bldg. Co..Philadelphia.
Newport News Ship Bldg. Co...Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Townsend & Downey Ship Bldg. Co.....New York.
Trigg, Wm. R. Co.....Richmond, Va.
Union Dry Dock Co.....Buffalo.
Union Iron Works.....San Francisco.
Wolff & Zwicker Iron Works.....Portland, Ore.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Marine Supply Co.....Fairport Harbor, O.
Moran, Bros. Co.....Seattle, Wash.
Upson-Walton Co.....Cleveland.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEEL OR IRON STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL SHAFTS, SOLID OR HOLLOW.

Bethlehem Steel Co.....So. Bethlehem, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Donohue & Co., John T.....Baltimore.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mfg. Co.....Milwaukee.

STOKERS FOR MARINE SERVICE.

American Stoker Co.....New York.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

STRUCTURES OF STEEL, BUILDERS OF.

Berlin Iron Bridge Co.....East Berlin, Conn.

SURVEYORS, MARINE.

Curr, Robert.....Cleveland.
Gibbs & Joys.....Milwaukee.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburgh.

THRUST COLLARS FOR PROPELLER SHAFTS.

Ball Bearing Co.....Boston, Mass.

TIMBER—LARGE PIECES.

Moran Bros. Co.....Seattle, Wash.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

American Tool Works Co. (The).....Cincinnati.
Bement, Miles & Co.....Philadelphia.
Chicago Pneumatic Tool Co.....Chicago.
Cleveland Punch & Shear Works Co. ...Cleveland.
Long & Allstatter, The Co.....Hamilton, O.
New Doty Mnfg. Co.....Janesville, Wis.
Pelton Engineering Co.....Cleveland.
Philadelphia Pneumatic Tool Co.....Philadelphia.
Standard Pneumatic Tool Co.....Chicago.
Wood & Co., R. D.....Philadelphia.

TOOLS, WOOD WORKING.

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

TRUCKS.

Boston & Lockport Block Co.....Boston, Mass.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Swain Wrecking Co.....Detroit.

TUBING FOR BOILERS.

Atlantic Tube Co.....Pittsburg.
Shelby Steel Tube Co.....Cleveland.

TUBES, SEAMLESS DRAWN, BRASS AND COPPER.

Hungerford Brass & Copper Co., U. T.....New York.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Jenkins Bros.....New York.

VARNISH MAKERS, COLOR GRINDERS, ETC.

Smith, Edward & Co.....New York.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Bull & Co, A. H.....New York.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Gibbs & Joys.....Milwaukee.
Hall & Root.....Buffalo.
Hawgood & Moore.....Cleveland.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Mitchell & Co.....Cleveland.
Moffat & O'Brien.....San Francisco.
Pauly, H. J.....Milwaukee.
Richardson, W. C.....Cleveland.

VENTILATING APPARATUS FOR SHIPS.

Buffalo Forge Co.....Buffalo.
Sprague Electric Co.....New York.
Sturtevant Co., B. F.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A..New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Egan Co., The.....Cincinnati.
Fay, J. A. & Co.....Cincinnati.
Woods Machine Co., S. A.....So. Boston.

WORM GEARING.

Morse, Williams & Co.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Calvin Co., The.....Kingston, Ont.
Donnelly Salvage & Wrecking Co...Kingston, Ont.
Playfair's Barge & Tug Line.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Electric Boat Co.....New York.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.

YACHT, MARINE AND SHIPS' BELL CLOCKS.

Ashton Valve Co.....Boston.
Bliss, John & Co.....New York.
Chelsea Clock Co.....Boston.
Ritchie, E. S. & Sons.....Brookline, Mass.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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MARINE REVIEW

VOL. XXI. CLEVELAND, O., JUNE 28, 1900. No. 26.

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BEST ANTI-FRICTION METAL FOR ALL MACHINERY BEARINGS.

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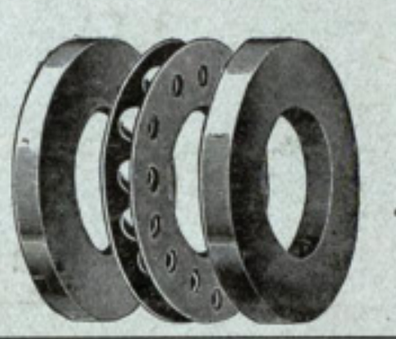

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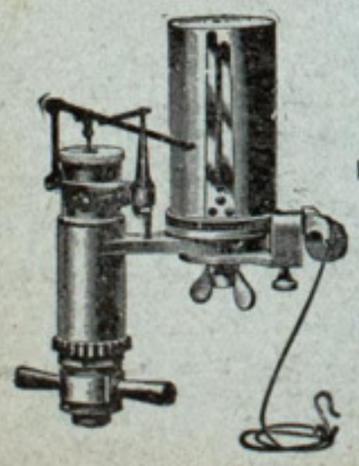

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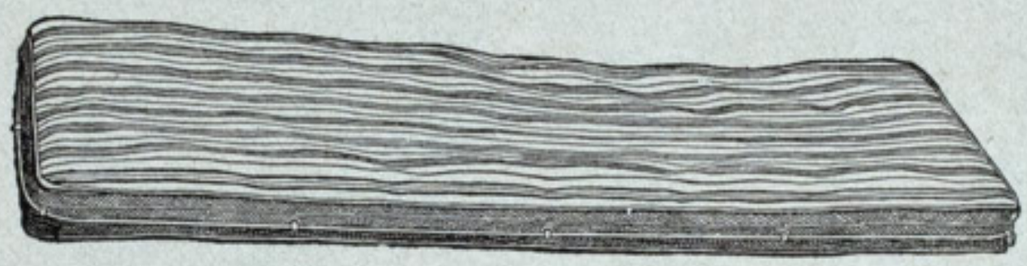

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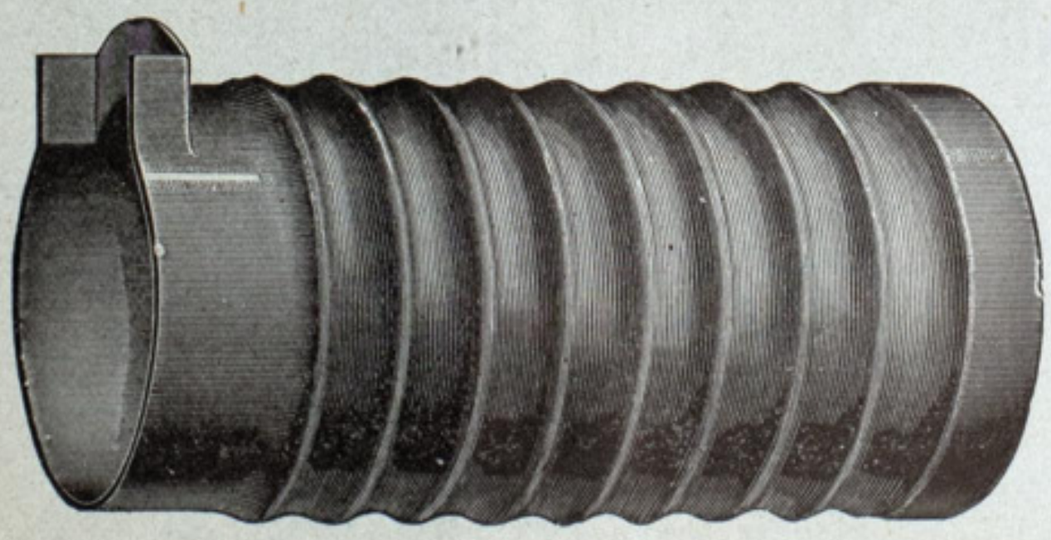

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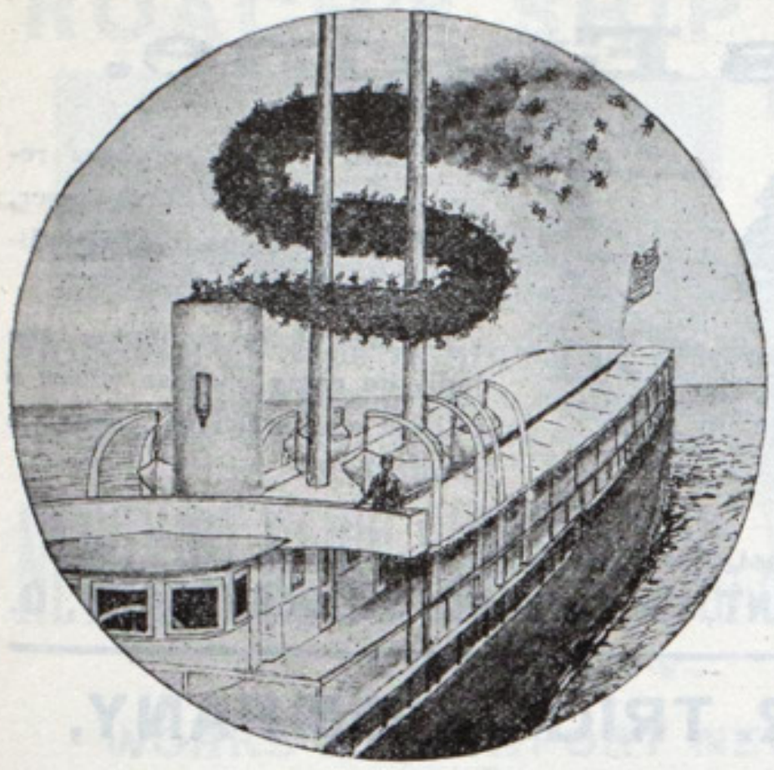

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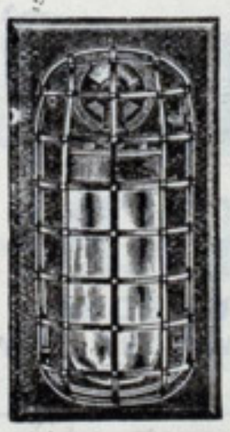

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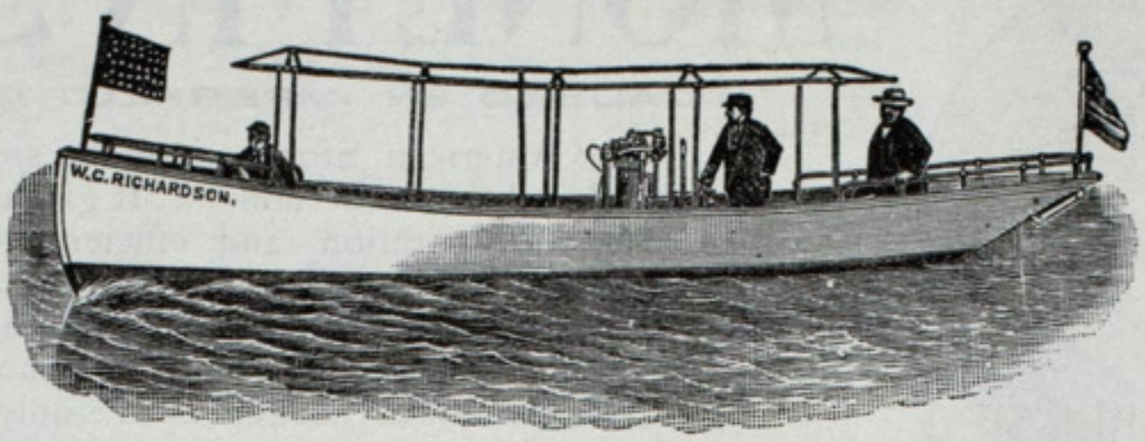

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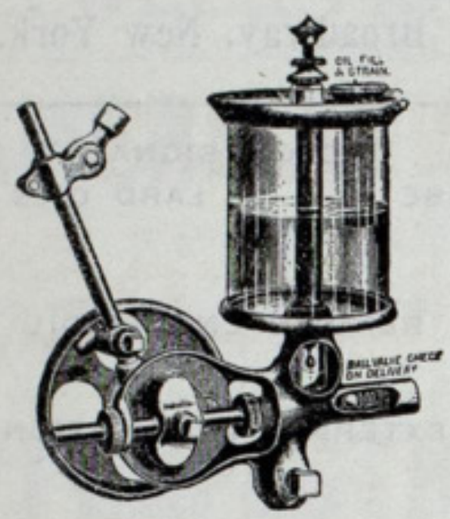

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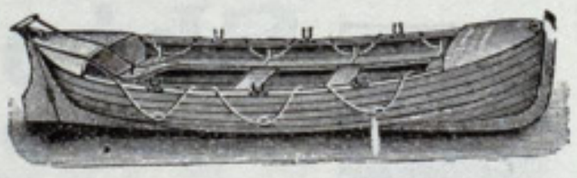

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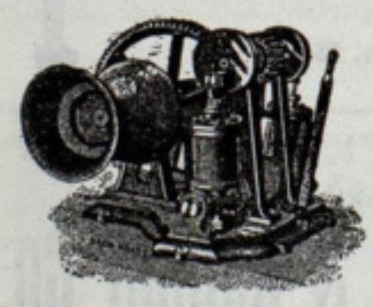

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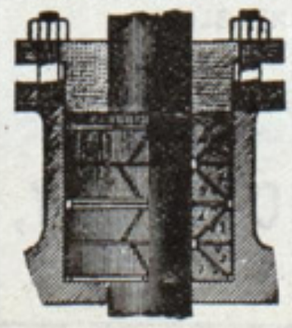

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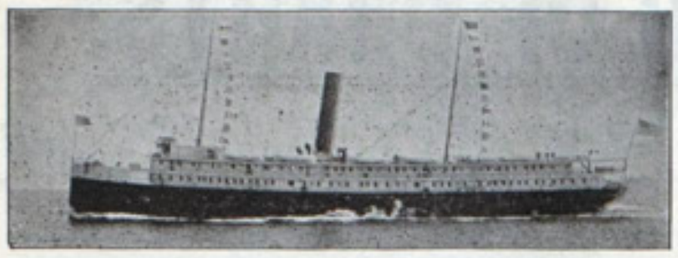

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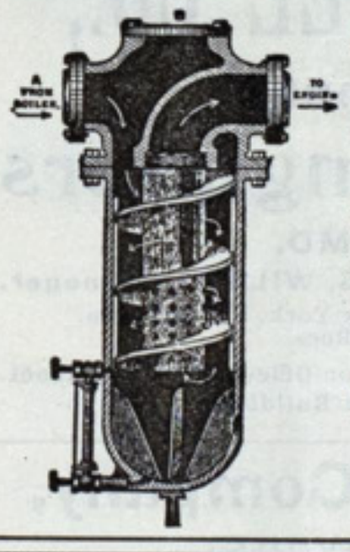

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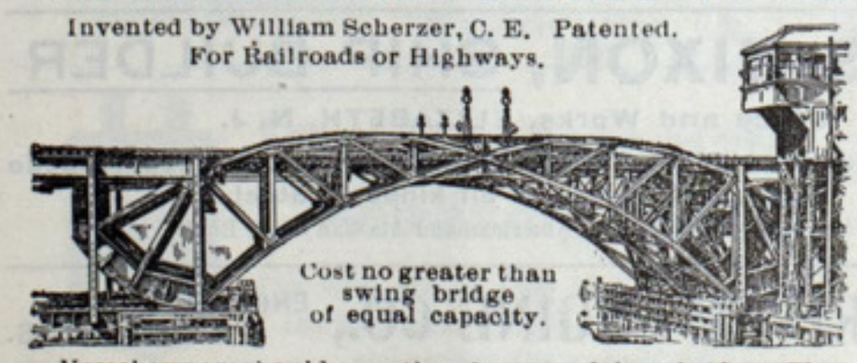

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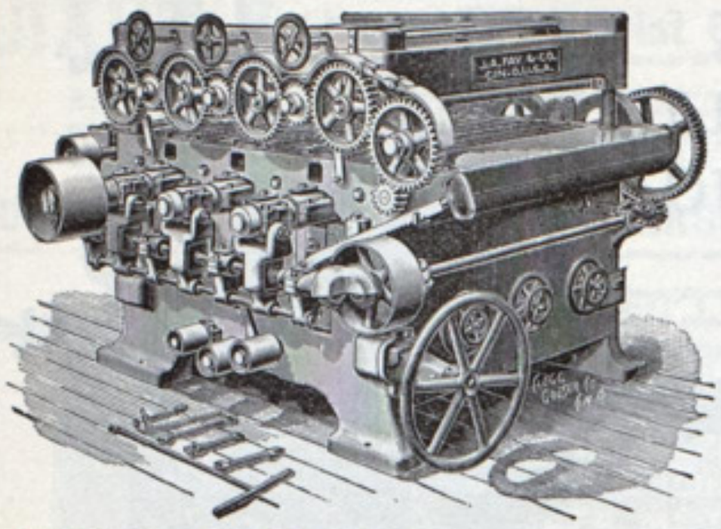

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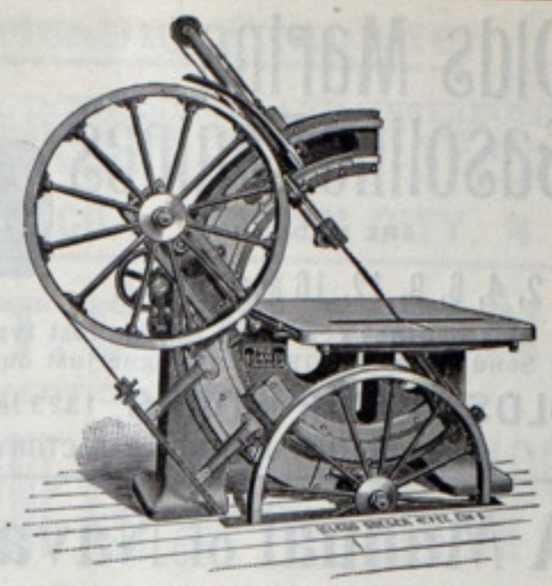

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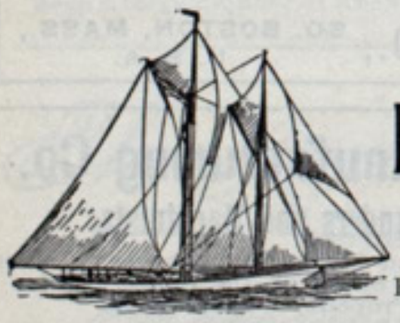

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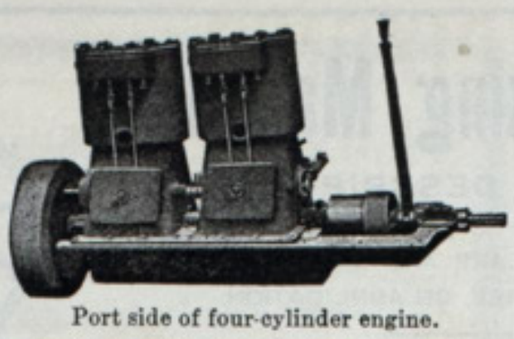

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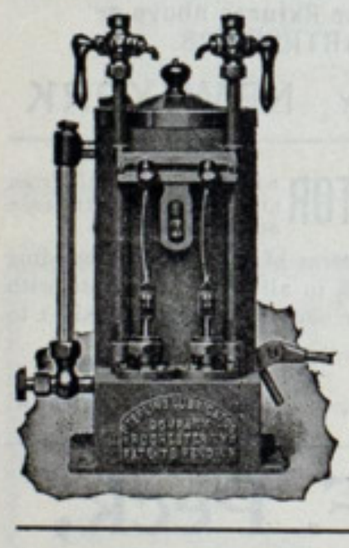

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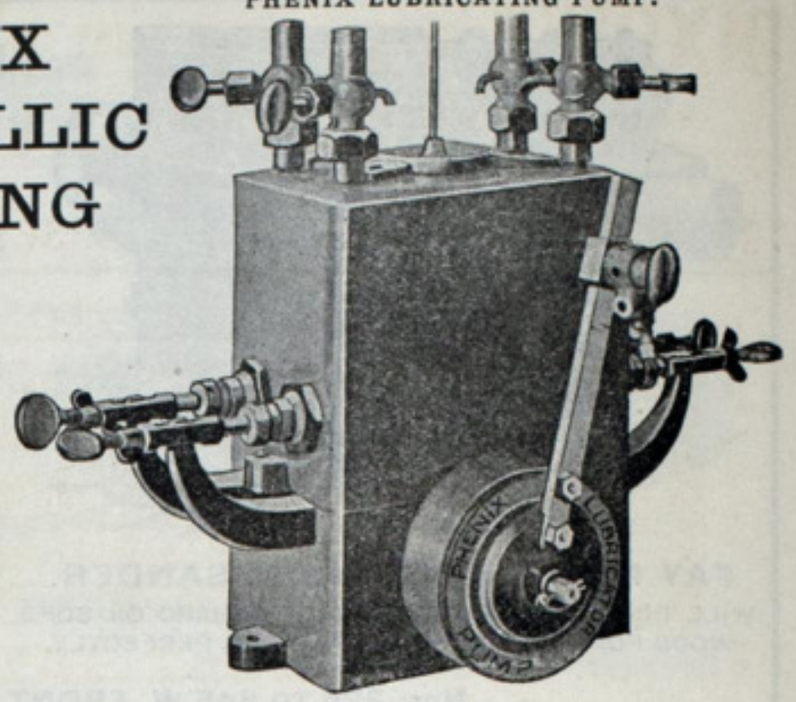

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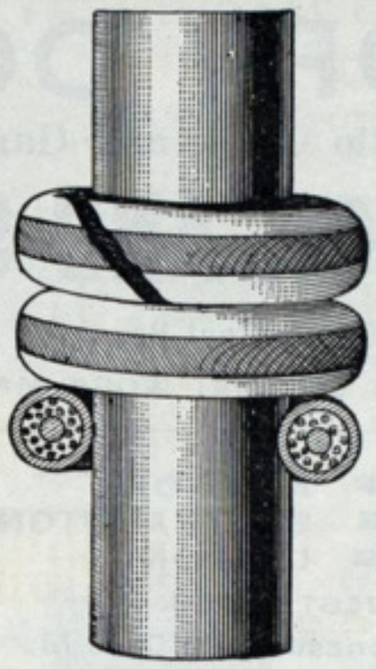

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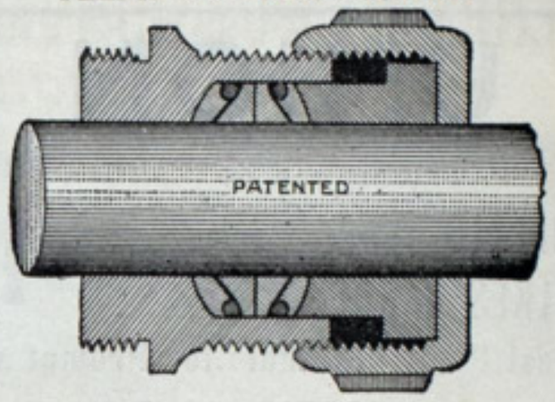

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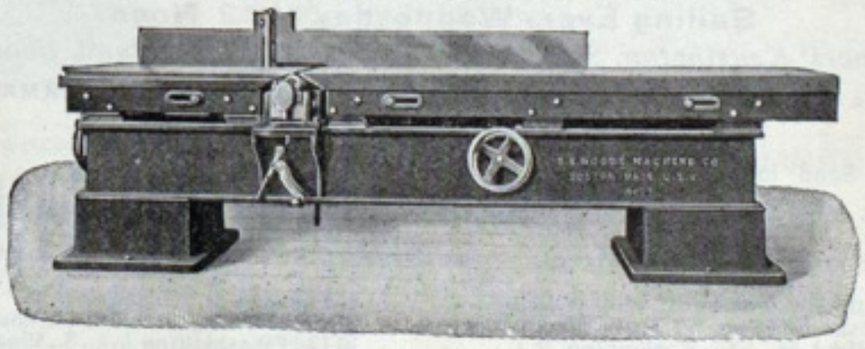

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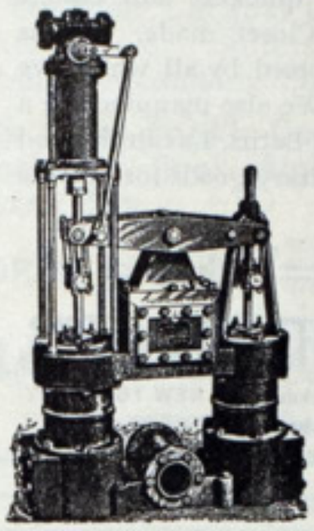

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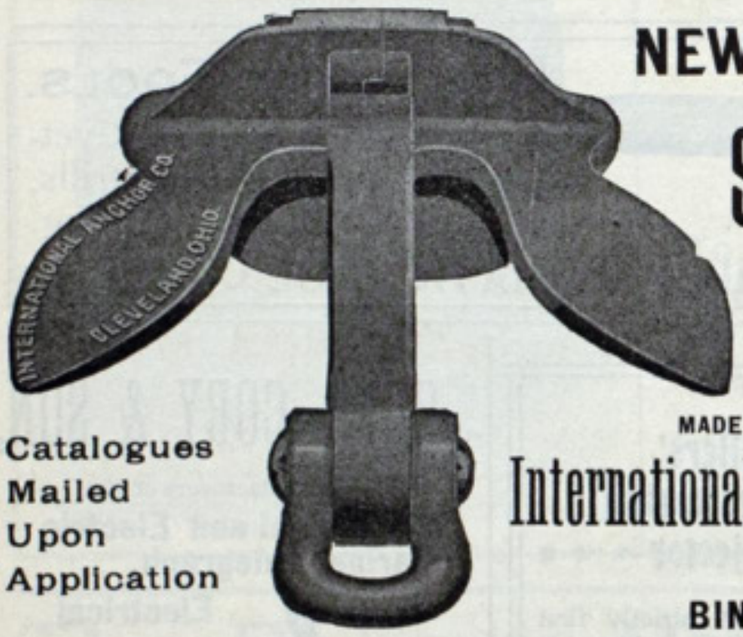

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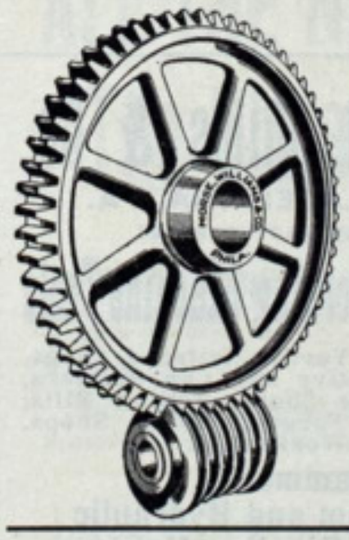

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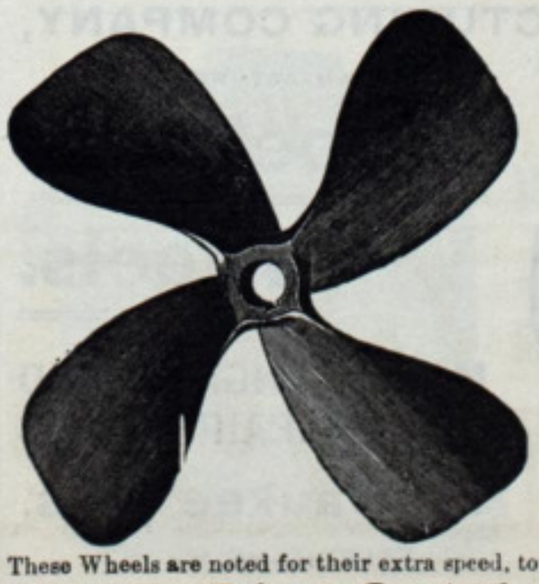

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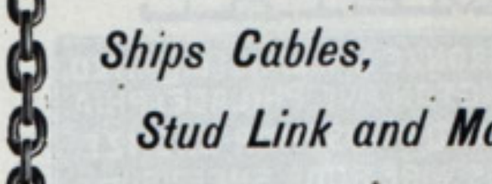

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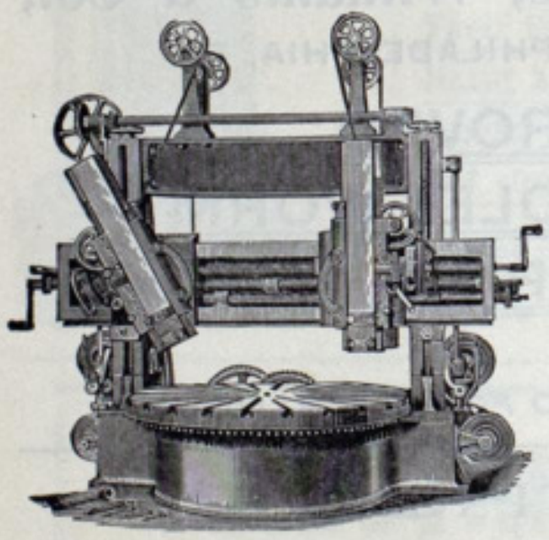

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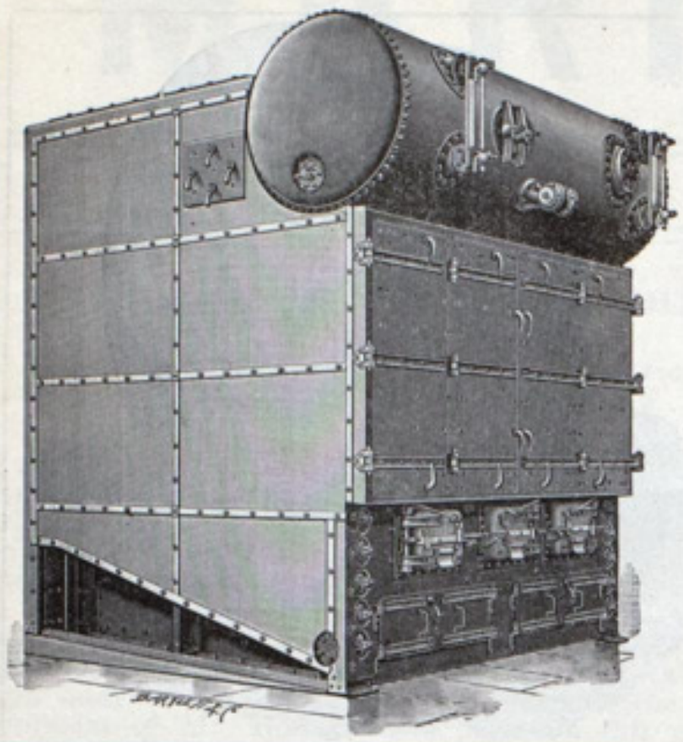

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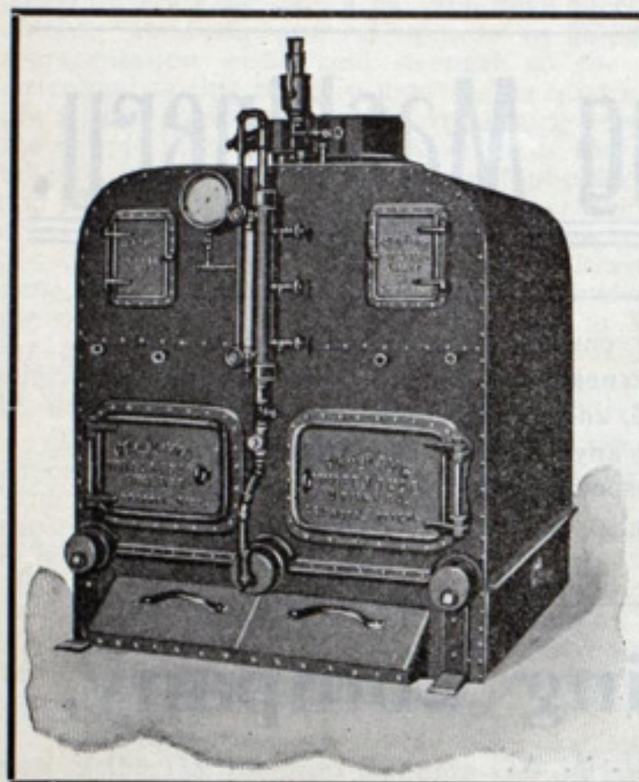

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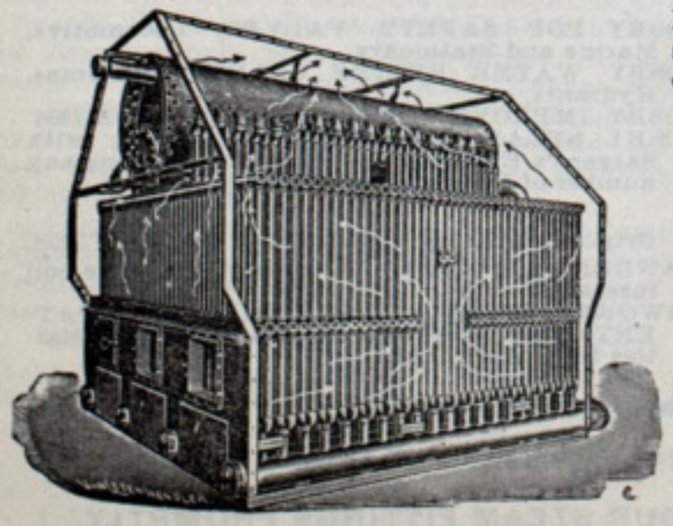

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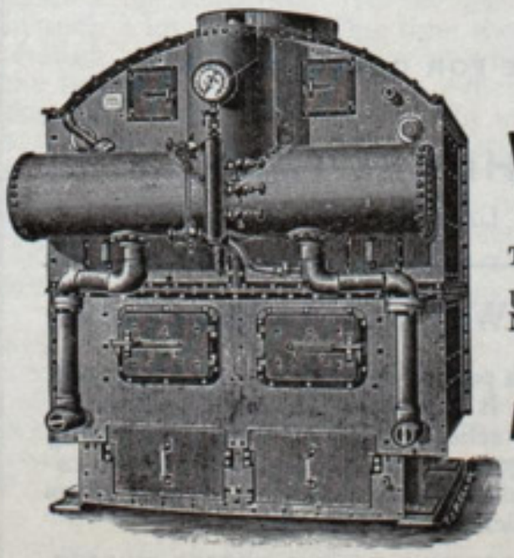

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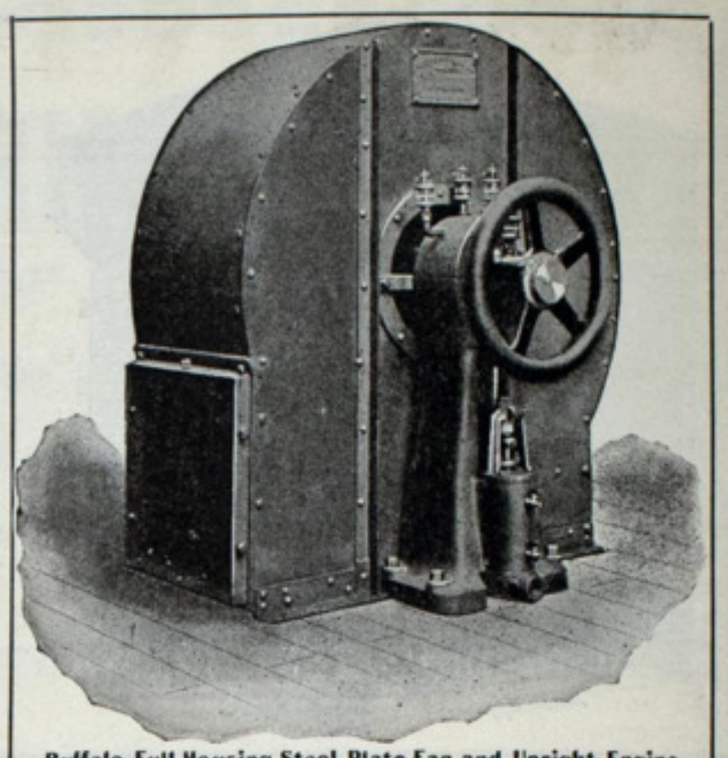

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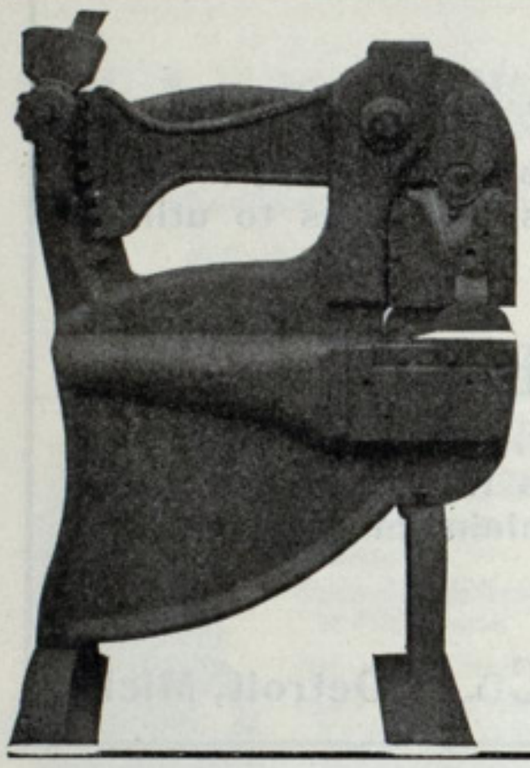

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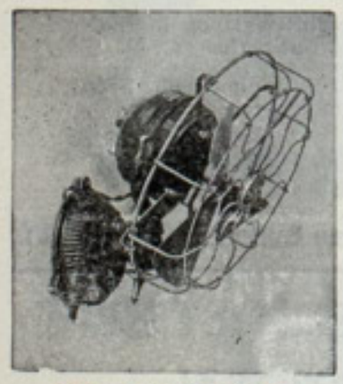

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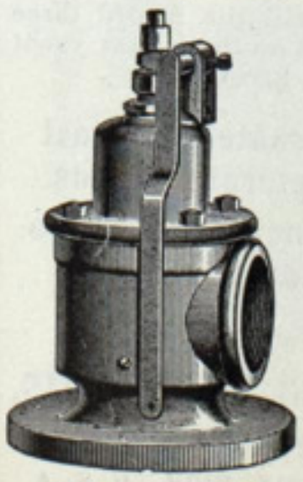

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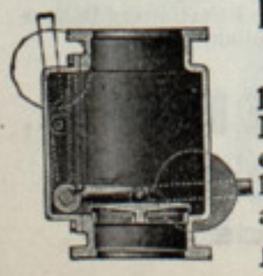

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